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CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICE—
Twenty-fourth General Meeting, American Gas Light Association 481

EDITORIALS—
Briefly Told 482
The Meeting at St. Louis of the American Association—"Fuel Gas in Cincinnati"—Notes.
Mine Gases and the Dangers thereof 483
Technical Education 484
*Guldlin's Valve Mechanism for Water Gas Apparatus 485
*Dixon's Gasholder for Railway Coach Lighting 486
The Revivification of Oxide of Iron 487
Power from the Trolley Circuit—is it Practicable? Why do Fire Insurance Companies Object? by Mr. H. S. Newton 488
Caring for Steam Cylinders and Pistons, by Mr. W. H. Wakeman.. 489
Modern Tools and Engineering 490
Special English Correspondence 491
Water Gas—London Water Supply—The Prepayment Meter—The Gas Stove and the Fire Grate.
ITEMS OF INTEREST FROM VARIOUS LOCALITIES 492
Mr. C. J. Luther to Take Charge at Rome, N. Y.—The "Summer Cooking School" of the Madison (Wis.) Company—Annual Meeting, Worcester, Mass.—Mr. S. A. Foley again in Possession of the Lincoln (Ills.) Works—Death of Mr. Benj. Thackara—Dividends for August, California Gas Shares—The Ignitive Hazards of Electricity and Illuminating Gas—The Prepayment Meter System, Lewes, England—Hint from Akron, Ohio—Commissioner Barker Home Again—Annual Meeting, Lewiston, Me.—Suing the Louisville Company—Death of Maj.-Gen. Jas. D. Morgan—Something More from Richmond, Va.—The Rochester (N.Y.) Gas and Electric Company—Mr. Whitney and Associates Secure Control of the Halifax (N. S.) Company—And Many Other Items.
The Fire Loss in 1895 494
Smoke Prevention 495
The Market for Gas Securities 495

[OFFICIAL NOTICE.]

Twenty-fourth General Meeting, American Gas Light Association.

OFFICE OF THE SECRETARY,
PROVIDENCE, R. I., Sept. 15, 1896.

There will be a general meeting of the American Gas Light Association held in St. Louis, Mo., on October 27, 28 and 29, 1896.

The meeting will be called to order by the President, C. J. R. Humphreys, of Lawrence, Mass., at 9:30 o'clock, A.M., on Tuesday, October 27, in the meeting hall at the Planters' Hotel, the headquarters, which occupies half a block on Fourth street, between Pine and Chestnut.

The Planters' is one of the very finest hotels in the West, and is conveniently reached by the principal street car lines, and is amply large enough to take care of all who attend the convention. The most satisfactory quarters are always obtained by writing in advance to the hotel people, and in doing so a reply should be requested, for which a self-addressed stamped envelope should be enclosed, as misunderstandings may thereby be averted. The Planters' is conducted on both the American and European plans. On the American plan there will be a few rooms at $3.50, plenty of rooms at $4, with bath, $5; or two adjoining, with bath between, $4.50 each, and up. European plan, $2 and $2.50 and up. Rates are the same for corresponding rooms on all floors above the third. The Southern Hotel is a fine house at Broadway, Fourth and Walnut streets, 2½ blocks from the Planters', and is American plan, $3 to $5 a day. The Lindell is a good house on Washington avenue, between 6th and 7th streets, six blocks from the Planters', and is American plan, $2.50 to $4.50 a day.

The change of date from the third Wednesday of October was made positively necessary by an entirely unforseen occurrence. During the first week of that month St. Louis is filled with visitors to the fall festivities, and this year the second week was chosen for the meetings of two very large associations, the Carriage Makers and the Street Railway people; but as the hotels would be unable to take good care of two such large conventions at the same time, the Street Railway convention was changed to the week of the third Wednesday, and as that convention meant about 3,000 persons in attendance, our members could not have been comfortably housed. The President and Secretary therefore went to St. Louis, and after mature consideration in consultation with the local members, it was fully decided that to hold our meeting on Tuesday, Wednesday and Thursday, October 27, 28 and 29, was the best arrangement that could be made.

The meeting hall will be the Ladies' Ordinary, on the parlor floor of the Planters' Hotel; thus the headquarters and hall will be in the same building.

The roll call will be made by means of the door card system. Each member upon entering the hall for the first time will at the door receive a special card upon which he will find his name, address, etc., as it appears on the Secretary's books, and such card should be corrected and given to the doorkeeper. Members in attendance should attend to this very carefully, as these cards are used immediately after the meeting for correcting the annual membership list. Visitors will please hand to the doorkeeper their personal cards.

A blank form of application for membership accompanies this circular. More can be obtained of the Secretary.

Remember, all applications must be in the Secretary's hands by October 17, at the very latest, otherwise they will not be acted upon at this meeting.

The list of papers to be read at the meeting is as follows:

"A Discussion of the Methods Employed in Introducing Gas Stoves," by Charles H. Nettleton, Derby, Conn.

"Some Experiments on Internal Illumination," by Carter H. Page, Jr., Philadelphia, Pa.

"Inclined Retorts up to Date," by Frederick Egner, Norfolk, Va.

"A Modern Retort House," by Wm. A. Miller, Cincinnati, O.

"The Separation of Water Gas Tar," by Alten S. Miller, Long Island City, N. Y.

In addition to the above there will be several topics brought in for discussion by short written introductions.

All questions for the Question Box should be sent in to the Secretary as soon as possible in order that they may be printed in the next circular before the meeting, thereby insuring their discussion.

During the days of the meeting all announcements will be posted on the bulletin board in the meeting room. All members are warned to take notice thereof accordingly.

All members attending the meeting are particularly requested to wear their membership badges in plain sight, thereby greatly aiding the officers and the Local Committee in their work, by affording a ready means of recognition.

In order that the Year Book containing the report of the St. Louis meeting may be published and issued to the members immediately after the meeting, notice is hereby given that if any of the speakers at that

meeting desire to correct their remarks in discussions before they are printed, they will be given an opportunity before leaving St. Louis, but *not* after. The stenographer will have typewritten copy of the principal discussions prepared at the headquarters between the sessions of the meetings, and all those who desire to correct their remarks *must* notify the Secretary at the close of the session at which such remarks are made, as all the report will be turned in to the printer immediately after the adjournment of the meeting.

Special rates for transportation have been granted (viz., full fare going and one-third fare returning by the same route) by the several Passenger Associations named and under the conditions noted.

The Central Passenger Committee, covering the following grounds: Bounded on the east by Pittsburgh, Salamanca, Buffalo and Toronto; on the north by the line of and including points on the Grand Trunk Railway from Toronto to Port Huron, thence via Lakes Huron and Michigan to the north line of Cook county, Ills.; on the west by the west line of Cook county and the Illinois and Mississippi rivers, to Cairo, including Burlington, Keokuk, Quincy, Hannibal and St. Louis; and on the south by the Ohio river, including points on either side of that river.

The Southern States Passenger Association, covering the territory south and west of the Virginias and south and east of the Ohio and Mississippi rivers.

The Trunk Line Passenger Committee, covering territory west of New England and east of Niagara Falls, Buffalo and Salamanca, N. Y.; Pittsburgh, Pa.; Bellaire, O.; Wheeling, Parkersburg and Charleston, W. Va.

The New England Passenger Association, covering nearly all of the lines in the New England States.

The Western Passenger Association, from points in Eastern Committee and Trans-Missouri Committee Territories.

The following extracts from the regulations of the railroads are cited for the information of the members. The special rates are granted subject to these regulations:

1. The reduction is conditional on there being an attendance at the meeting of not less than 100 persons holding certificates.

2. Each person to obtain the excursion rate must purchase a first-class ticket (either limited or unlimited) to the place of meeting, for which he will pay regular fare, and upon request the ticket agent will issue a printed certificate of purchase of the standard form. Agents at all important stations are supplied with certificates.

3. If through tickets cannot be procured at the starting point, purchase short-trip ticket to the most convenient point where such through tickets can be obtained, and there purchase through to place of meeting, requesting a certificate from the ticket agent at the point where each purchase is made.

4. Tickets for the return journey will be sold by the ticket agent at the place of meeting at one-third the highest limited fare, only to those holding certificates signed by the ticket agent at point where through ticket to place of meeting was purchased, and countersigned by signature written in ink by the Secretary of the Association, certifying that the holder has been in regular attendance at the meeting.

5. No reduction of fare will be made on the return passage if the going ticket is purchased more than three days before the opening date of the meeting; except that when meetings are held at distant points to which the authorized limit is greater than three days, tickets may be purchased before the meeting in accordance with the limits shown in regular tariffs.

6. Certificates are not transferable, and return tickets secured upon certificates are not transferable. The transfer of any such is liable to prevent the securing of reduced rates for future meetings.

7. The certificate of agent at starting point, duly endorsed by Secretary of Association, must be presented to ticket agent at place of meeting, within three days (Sunday not reckoned except by Southern Passenger Association) after adjournment of meeting. The return ticket will be for the line or lines covered by the going ticket.

8. No refund of fare will be made on account of any person failing to obtain a certificate.

Special.—Those desiring to join the New England party should communicate at once with C. J. R. Humphreys, Lawrence, Mass. Those wishing to join the New York party should communicate with C. E. Sanderson, 32 Pine street, New York city. Be sure to obtain your railroad certificate when buying your ticket for St. Louis. Apply for ticket and certificate at least 30 minutes before train time. Each person must sign his own certificate at time of purchasing ticket for St. Louis. Be sure to have the Secretary endorse your certificate at St. Louis as soon as you get there. Apply for return ticket at least 30 minutes before train time, and have your certificate with you. Any person, ladies included, attending the meeting, is entitled to the reduced rate from the territories named.

Members will please hand their certificates to the Secretary, or his Clerk, upon arrival at place of meeting. If there are one hundred members present, holding certificates, each certificate will then be properly endorsed and handed back to owner before adjournment.

Extracts from the Constitution.

Sec. 12. Application for active membership or for associate membership, or for transfer from associate to active membership, must be received by the Secretary at least 10 days prior to the meeting at which the application is acted on.

51. No member who owes two years' dues shall be entitled to vote, or to participate in the deliberations of the Association, or to receive a copy of the proceedings.

52. Any member whose dues shall remain unpaid for a term of three years may be dropped from the roll of membership by a vote of the Council.

A. B. Slater, Jr., Secretary.

BRIEFLY TOLD.

The Meeting at St. Louis of the American Association.—The official notice from Secretary Slater, respecting the 24th convention of the American Gas Light Association, is so complete that little can be said here on our own account in connection with the preliminaries that would have the merit of newness to recommend it. However, it is satisfactory to know that our remarks of a fortnight ago, in explaining why it had been found necessary to put the meeting over to the last week of October instead of the third week of that month, as provided for by the rules of the Association, are amply sustained in Secretary Slater's well-worded circular. No one may rightfully claim that the Planters' Hotel can be considered as other than a first-class place for headquarters, and a like statement applies to its eligibility as a convention hall and as an abiding place, so all the conditions in the named respects are indicative of the greatest possible measure of comfort for those who shall attend the meeting. To secure the Planters', even for the time named, required the exercise of not a little "ingenious oratory," by President Humphreys, Secretary Slater and at least one St. Louis gas man, wherefore it would seem that the members this year should strive to appear in St. Louis in convention week in such numbers that the "tentative" estimates of the arrangers for headquarters to the Planters' managers will be more than made good. The paper list, while not lengthy, is exceptionally promising, both veterans and recruits—which classification means that those who have heretofore figured on the paper list are laboring side by side with others who have not so figured—joining in the presentation of matter for the education or advancement of all. The officials were, after some dint of persuasion, enabled to secure the one and one-third fare for the round trip from the railway carriers in such degree that virtually all those who attend the meeting can avail themselves thereof. The instructions regarding the means of securing the rebate are so explicit that we need not refer to the matter here, although we will repeat the last (eighth) injunction, that "No refund of fare will be made on account of any person failing to obtain a certificate." It is more than likely that the delegates from this section of the country, who propose to make the trip in cars reserved for the party, will start from New York, over a route not yet determined, but of which due notice will be given. This means that the proposed special cars from Boston will in all probability not be arranged for. Those who intend to join the membership lists at St. Louis should not forget that their applications must be in the Secretary's hands on or before October 17th.

"Fuel Gas in Cincinnati."—It was not for a moment thought by anyone who keeps fair track of the development of the legitimate gas industry of the country that the proposition to manufacture fuel gas "in the vicinity of Cincinnati," unless that manufacture were in the immediate control of General Hickenlooper and his associates, would be supinely watched or that the schemers for such supply would not be vigorously combated. No matter what the speculations were, the fact is that General Hickenlooper has been "at them again," and his attack on the very thinly concealed schemes of the promoters of the "coke oven process," who located themselves in the outlying village of St. Bernard, with the hope that later on they would be supplying some sort of gas in Cincinnati, is in the General's best vein. All of which means that we are in receipt of a copy of a pamphlet (184 pages), just issued from the press of the Robert Clarke Company, of Cincinnati, in which General Hickenlooper exposes the poverty of the claims in general of those who have been pushing "fuel gas" for all it is worth—to them, and in which he clearly shows that, if Cincinnati is desirous of having a fuel gas supply on a large and on a safe and economical scale, the means for such an end are now existent in Cincinnati, in the product that is being distributed by the Cincinnati Gas Light and Coke Company. The pamphlet is virtually a reprint of the argument offered by the General to the Board of Administration, of Cincinnati, in opposition to the Board's seeming indorsement of the action of the Village Council of St. Bernard, when that body authorized a certain set of schemers to set up a plant for the purpose of distributing fuel gas made under the coke oven process.

Notes.—We have received, from Messrs. R. D. Wood & Co., of Philadelphia, a handsomely gotten up pamphlet descriptive of the "Taylor Gas Producer," which plant is designed to work on the "Application of Producer Gas to Manufacturing Purposes." Of course, the pamphlet is largely devoted to words and cuts descriptive and illustrative of the workings of the Taylor gas producer, but its main value to the gas man will, we think, be found in the concluding chapters, which are given over to a *resume* of Mr. W. J. Taylor's paper on "The Energy of Fuel: Solid, Liquid and Gaseous."——The proposition to place a gas works in Three Rivers, Mich., has been renewed. It ought to afford sufficient support for such a venture.——We understand that Mr. C. F. Cox, of Freehold, N. J., has purchased a controlling interest in the Mount Holly (N. J.) Gas Company from the New Jersey Gas Improvement Company.

Mine Gases and the Dangers Thereof.

In a paper on the coal mining industry of Great Britain, presented to Parliament by Dr. John Haldane, the author has this to say respecting the dangers, etc., of mine gases :

The Composition of After-damp.—The after-damp of a colliery explosion has not yet been satisfactorily analyzed. In the absence of direct evidence, however, it is possible, from various data, to obtain a rough idea of its composition. It is evident, in the first place, that the composition of undiluted after-damp, may vary : Firstly, according as the explosion is one of dust, or of firedamp alone ; and secondly, as the proportion of oxygen present in the track of the explosion is sufficient or not to consume the whole of the combustible material (gas or dust) present in the air. The simplest case is that of an explosion of firedamp in presence of excess of pure air, and this may be considered first. The firedamp, or explosive gas, met with under ordinary circumstances in the coal mines of this country, appears to be nearly always simply methane or marsh gas (CH_4). When marsh gas explodes in presence of excess of air, the reaction is as follows :

$$CH_4 + 2\,O_2 = CO_2 + 2\,H_2O.$$

The nitrogen of the air takes no part in the explosion, but for every two volumes of oxygen consumed, or for every volume of carbonic acid found, nearly eight volumes of nitrogen (and argon) will be left behind. Hence a simple calculation will show that after the aqueous vapor has condensed, the undiluted afterdamp will consist of—

Nitrogen	87.23	88.28
Argon	1.05	
Carbonic acid	11.72	
	100.00	

Carbon Monoxide Gas.—This gas is present in afterdamp, smoke and "gobstink" (*i.e.*, the mixture of gases given off from coal which has spontaneously heated). It differs from other poisonous gases in its particularly slow and insidious action, and to render this action intelligible some explanation is necessary. The oxygen absorbed from the air in the lungs is normally taken up by the blood in the form of a loose chemical combination with the red coloring matter (hæmoglobin) of the corpuscles, and so carried by the circulation to the tissues, where it is used up. The hæmoglobin not only combines with oxygen, but also forms a much more stable compound with carbon monoxide and, as was shown by Claude Bernard, hæmoglobin which is saturated with carbon monoxide cannot take up oxygen. Hence, when the blood of a living animal is saturated with carbon monoxide no oxygen can be conveyed by the hæmoglobin, from the lungs to the tissues, and death must occur from want of oxygen. Carbon monoxide has no other effects than those caused by interference with the oxygen supply to the tissues. Apart from its property of combining with the hæmoglobin, it is a physiologically indifferent gas like nitrogen. The symptoms produced by it are therefore essentially the same as those described above as due to partial or complete absence of oxygen in the air breathed. The key to the peculiarly insidious action of carbon monoxide is afforded by the following two facts :—(1) The affinity of carbon monoxide for hæmoglobin is a very powerful one, so that even when a very small percentage of it is present in the air, absorption by the blood may go on steadily, though slowly, until finally the oxygen-carrying power of the hæmoglobin is reduced to a dangerous extent : (2) the symptoms produced by deficiency in the oxygen supply to the tissues are, as already remarked, very slight up to the point at which there is loss of power over the limbs. When the limbs completely fail it is, of course, impossible for a man to get out of the poisonous atmosphere. The affinity of carbon monoxide for hæmoglobin is about 250 times as great as that of oxygen. In other words, the hæmoglobin of blood brought into contact with air containing about 0.1 per cent. of carbon monoxide will finally become about equally saturated with carbon monoxide and oxygen. If the same blood be afterwards brought into contact with pure air, constantly renewed, the carbon monoxide is gradually driven out. This process of driving out occurs about five times as fast in pure oxygen (which contains about five times as much oxygen as air). When the blood of the living body has become about 50 per cent. saturated with carbon monoxide, there is loss of power over the legs. These facts make it possible to understand the process of gradual poisoning, or of recovery in fresh air. With less than 0.1 per cent. of the gas in the air the blood does not become more than 50 per cent. saturated, so that even a prolonged exposure does not cause complete helplessness. With 0.2 per cent. the blood will become about 67 per cent. saturated, and complete helplessness, with loss of consciousness, would doubtless occur. Probably this percentage would finally cause death, from the gradual damage produced by the diminished supply of oxygen to the tissues ; 0.30 per cent. would certainly cause death in time.

Carbonic Acid Gas.—Carbon dioxide (or carbonic acid) when present in great excess, is a distinctly poisonous gas. It does not act, as sometimes stated, by merely diluting the oxygen of the air. Air mixed with 50 per cent. of carbon dioxide causes rapid death, while air mixed with an equal proportion of nitrogen has very little effect. As shown above, however, there can never be more than about 12 per cent. of carbon dioxide in afterdamp, and in practice it can seldom or never occur that even this moderate percentage is present. In breathing air containing increasing proportions of carbon dioxide, the first distinct effects are felt with about 3 or 4 per cent. The respirations become somewhat deeper, but nothing further is experienced. Animals may be kept for weeks in such an atmosphere without apparently suffering inconvenience.

The respirations increase with the percentage, both in frequency and depth, until with about 6 per cent. there is distinct panting. At the same time slight frontal headache may be felt, which often increases for a short time when fresh air is again breathed. At 7 or 8 per cent. the panting is very distressing, especially at first, and with 10 or 11 per cent. the respiratory distress is extreme.

With a somewhat higher percentage an anæsthetic action seems to occur, so that consciousness is benumbed or entirely lost, although life may not be endangered, at least for many hours, judging from experiments on animals. The action of air containing carbon dioxide on lights (candles, lamps, etc.) seems to depend almost entirely on the reduction of the oxygen percentage which accompanies the dilution of the air with carbon dioxide. According to Professor Clowes, an atmosphere containing about 15 per cent. of carbon dioxide extinguishes lights. Air diluted with 17 per cent. of nitrogen has the same effect. I have myself found that a light (candle) will burn in a mixture containing 75 per cent. of carbon dioxide if 25 per cent. of oxygen be present at the same time. Contrary to what is often stated, carbon dioxide has thus very little specific action in extinguishing flames.

Mixtures of Nitrogen and Oxygen.—Nitrogen has no specific action on men or animals. When added to air it only acts indirectly by diminishing the oxygen percentage. Other physiologically indifferent gases (such as hydrogen) have the same indirect action. When the oxygen percentage of air is gradually reduced by absorption of the oxygen, or (what is exactly the same thing) by addition of nitrogen, very little may be felt before the occurrence of impairment of the senses and loss of power over the limbs. If the reduction is gradual, and the symptoms be carefully watched, it will be noticed that at about 12 per cent. of oxygen (*i.e.*, with a reduction of 9 per cent.) the respirations become just perceptibly deeper. At 10 per cent. the respirations are distinctly deeper and more frequent, and the lips become slightly bluish. At 8 per cent. the face begins to assume a leaden color, though the distress is still not great. With 5 or 6 per cent. there is marked panting, and this is accompanied by clouding of the senses and loss of power over the limbs, which would probably end sooner or later in death.

It is probable that any sudden exertion made in air markedly deficient in oxygen may lead to temporary loss of consciousness, so that sudden efforts should be avoided in all cases where, through accident or necessity, a man is in an atmosphere which will not support a light, and in such a position that he might fall into worse air or otherwise injure himself. When air containing less than 1 or 2 per cent. of oxygen is breathed, loss of consciousness, without any distinct previous warning symptom, occurs within about 40 or 50 seconds. Loss of consciousness in air deprived of oxygen is more rapid than in drowning or strangling, since in the former case not only is the supply of fresh oxygen cut off, but the oxygen previously in the lungs is rapidly washed out. Loss of consciousness is quickly succeeded by convulsions, which are followed by cessation of the respirations. The heart still continues to beat, in the case of cats and dogs, for from two to eight minutes ; in man this period is probably longer, for it seems to be a general rule that the larger an animal is the longer it will resist asphyxiation. I have myself breathed for half a minute, without loss of consciousness, an atmosphere (containing 0.7 per cent. of oxygen) which, within 15 seconds, produced in a mouse not merely loss of consciousness, but convulsions, followed by almost complete cessation of the respiratory movements. So long as the heart is beating, however feebly, animation may be restored by artificial respiration. This may require to be continued for a considerable period, as the after effects of deprivation of oxygen are very serious, and the respiratory center may not recover for some time. After the breathing has been re-established

consciousness may not return for many hours, and very careful treatment may be required to avert death at a later stage. Candles or safety lamps are extinguished when the percentage of oxygen falls to from 18 6 per cent. to 17.1 per cent. An upright tallow dip goes out at about 17.6 per cent. of oxygen but by holding it horizontally and spreading out the wick, it may be made to burn until the percentage is reduced to 17.1 per cent.

Sulphurous Acid.—As it seems probable that sulphurous acid is present in after-damp, and causes the well-known irritation of the eyes and air passages, some account of its action is desirable. According to Lehmann, as little as .001 per cent. produces slight irritation of the respiratory passages. With .003 per cent., the symptoms of irritation are very marked. Ogata found that .04 per cent. of the gas caused dyspnœa and signs of inflammation in the eyes and air passages in rabbits and other animals. About 0.1 per cent. was sufficient to cause death after some time. Sulphurous acid is thus an exceedingly poisonous gas; but the symptoms of irritation caused by it seem to occur long before there could be any danger to life. Its presence in after-damp, therefore, affords a valuable indication of danger. Sulphurous acid, when breathed in poisonous proportions, causes decomposition of the hæmoglobin, so that the two absorption bands shown by the spectroscope in diluted blood become finally much less visible than usual. Bearing in mind the possibility that poisonous proportions of sulphurous acid might be present in after-damp, I carefully examined the blood for evidences of decomposition of the hæmoglobin. Although the hæmoglobin seems to be slightly decomposed, this condition could not have materially contributed towards death. There was also no distinct indication of irritation of the air passages in the dead horses, and a survivor, whose lungs I carefully examined about 30 hours after the explosion, had no symptoms of bronchitis or pneumonia, although he was still almost unconscious, and must have been exposed for long to the after-damp

Respirators for Passing through After-damp.—It would require about 120 litres, or 4 cubic feet, of oxygen to keep a man alive for two hours while making his escape to the shaft, or for six hours while remaining at rest. At the commonly employed pressure of 120 atmospheres, this volume of oxygen can be compressed into a steel cylinder of the capacity of 1 litre, or 1¾ pints. The apparatus required for economically breathing this oxygen must be constructed on the principle known to physiologists as that of Regnault and Reiset's respiration apparatus. In a paper on "Colliery Explosions," read before the British Association meeting in 1894, I described two simple models of apparatus of this kind; and many years ago Mr. Fleuss devised a more elaborate one on the same general lines. But for the fortunate circumstances that colliery explosions are of such rare occurrence, appliances of this kind would doubtless have already come into use. Compressed air would not be nearly so available as pure oxygen, since at least ten times as much of it would be required. No respirator could be of any use against after-damp, as there is no known absorbent which could be practically applied to arrest carbon monoxide.

Rescue from Fire and Smoke.—In the case of a fire occurring in or near a main airway in a mine, any hesitation or mistake on the part of the officers of the pit may have terrible consequences. It is, therefore, of great importance that the danger be thoroughly realized, and such orders issued beforehand by the manager that the promptest action may be taken by those on the spot.

The main points are to keep the smoke and gases from the fire from entering the workings until the men are withdrawn, and to prevent men from running into the smoke in their efforts to get out. The ventilation to the seat of the fire should, therefore, be cut off as soon as possible, so the smoke may not be carried inwards. If the fire is in or near the downcast shaft, the fan should be stopped at once, and the top of upcast shaft opened, so that the smoke may pass up the downcast. Meanwhile, the men in the pit should be withdrawn past the seat of the fire by the return airway, a man being also stationed, if possible, at some point on the intake beyond the fire to prevent others from running into the smoke. Should the smoke get far into the workings, the men cut off by it ought not to attempt to reach the shaft through the smoke by the intake. In many cases they will be able to reach the upcast shaft in time by hurrying out along return airways if they know the way. Failing this, their wisest course will be to go at the first warning as far as seems safe along the intakes, and there to open a door into the return airway, so as to short-circuit the smoke. They should then erect curtains to keep the smoke back, and direct it all into the return airways. In this manner time will be gained; and, even if the fire cannot be got under, those on the surface may be able to stop, or partly reverse, the ventilation, and thus render escape by the return airways possible.

Technical Education.

Engineering, in editorial comment on this subject, says that some eight or nine years ago that excellent gentleman Mr. John Bull made a great and startling discovery. The good, easy going fellow had inherited from his father a magnificent business which had practically no rivals in the markets of the world. Repeated experience had given him a supreme contempt for the efforts of rival houses; and, in fact, his position seemed so secure that he thought he might be permitted to take matters easily, whilst quietly enjoying the vain, if strenuous, attempts of his rivals to enter into competition with him. After some years of this blissful repose, he awoke one afternoon to the fact that his dividends were less substantial than they ought to be, and that foreign firms, if they had not succeeded in diminishing his turnover, had at any rate very substantially affected his rate of profit. The good gentleman could not be bothered just then into examining the matter closely, so simply gave instructions to cut down unremunerative expenditure, as he was pleased to consider experimental work of every kind, and went on as before. The next time he went through his accounts matters appeared to be still more alarming, and this time he determined to find out something as to the cause of his rivals' success. He was soon struck by the fact that abroad every factory had a technically trained chief, whilst he had been rather priding himself on the fact that there was no theory about his business, that his works manager and chief draughtsman were "thoroughly practical" men, inasmuch as whilst they could show a fitter or turner how to do his work, they were often incapable of fixing, for instance, the proper thickness of wall for a hydraulic cylinder, or of determining the strains in a simple lattice girder or workshop crane. For any work requiring calculations to be made, a consulting engineer was called in. The latter in some cases was incompetent, whilst in almost all he was more concerned in maintaining a reputation for infallibility than in endeavoring to execute the work in the most economical manner. In short, money—other people's money—was no object to the consulting engineer, as witness many of the bridge designs which have emanated from Westminster in the past.

After a survey of the whole question, Mr. Bull decided that he also must have technical education, and he determined to outdo his competitors, if not in the quality of it, at least in the matter of quantity. Every man, from the drilling machine tender to the chief draughtsman, was to have a smattering of scientific knowledge. Technical institutions arose like magic throughout the country, and were in the aggregate heavily endowed both with imperial and local resources. In London alone it is estimated that $2,500,000 represents the capital expenditure on these polytechnics, whilst the cost of maintenance exceeds $600,000 per annum, for a kind of work which might very well have been done by evening classes held in the various board schools. Some ill conditioned grumblers did indeed suggest that they could not perceive that research in the chemical trade, for instance, was likely to be much advanced by the yardmen learning to perform a simple inorganic analysis. Important discoveries are not usually made by tyros, they ventured to remark, but in the general enthusiasm their warnings have passed unheeded, whilst the fantastic views of their opponents have found fitting expression in the remarks of the Chairman of the London County Council, who was eloquent on the advantages to a bricklayer of a knowledge of the chemical qualities of clay. Reasoning is, of course, wasted on a gentleman who can make a remark of that nature; but when the hot fit is over, a sad awakening lies before the public. In every industry, the vast majority of employees must be content to simply obey orders, thankful if the acquirements and abilities of their chiefs are sufficient to secure to the district a fair share of the world's work. In commercial as in national warfare it is the leaders that count. Change leaders, and the body of men defeated before at every engagement may become as uniformly victorious. To supply such leaders should be the aim of our technical schools, in place of which they fritter away their resources in the attempt to give every private in the ranks a smattering of higher strategy. The city and guilds of London have been amongst the few public bodies who have not been carried completely away by the existing craze, though the pressure has been so great on them that even they have yielded somewhat. In their Central Technical College each department is under the control of a thoroughly competent professor, and it is doubtful if at any foreign school a better training can be acquired than here. Four more such colleges, at most, would fill all the requirements of the kingdom, and if the local and imperial authorities would expend their resources in instituting scholarships to such, instead of squandering them on "smatter" shops as at present, such scholarships would give every lad

fitted to climb, or lead, his opportunity, whilst with the money saved, the equipment of the laboratories of the leading schools would soon be unexcelled in the world. At present a lad gets a smattering of the differential calculus, for instance, at some polytechnic, and immediately feels he is fitted for something better than running a planing machine. If he is, well and good ; he will not mind that machine long before he has the offer of more remunerative employment ; but if every lad in the country is given this smattering, whilst only a small fraction are worthy of promotion, the ninety and nine left in the workshop wilderness are possibly spoilt for mechanics without being fitted for anything better. Every facility should be given for the exceptions to rise from the ranks, but any attempt to establish an educational dead level is likely to be disastrous. As the mass cannot be raised to the level of the leading men, the alternative of degrading the latter to the lower plane must in such a case be adopted.

So far as the middle classes are concerned, some sort of excuse may be made for the existence of many of these low grade schools of science. The whole of our middle class educational establishments are still overshadowed by the classical tradition. At the public schools a modern side has in many cases been grudgingly instituted, but the modernists are looked down upon not only by the general body of masters, but also by the bulk of the boys themselves. The consequence is that the average youth leaves one of our public schools with a more or less plentiful knowledge of Greek and Latin words, but with very little acquaintance with the facts of natural science. Our private schools are still worse, being pretty frequently controlled by a head master who has failed as a parson, a state of affairs which has long been traditional in these islands, as Sir Walter Scott refers to it as a common practice in the Scotland of his day. This being the case, the polytechnics undoubtedly do assist the sons of the bourgeoisie to get some fragments of scientific knowledge which they are, as yet, too often denied at school, but it was scarcely with this object in view that $2,500,000 has been expended on the London institutions alone.

Though unconnected with matters of general policy, one excellent feature of American technical schools is worthy of imitation here ; that is, courses of lectures delivered by practicing engineers. These lectures have in many cases been very valuable, attention being concentrated on small details usually neglected in text books rather than on general principles, which can be quite as well set forth by a pure bookman. On this side of the Atlantic technical school managers do not, as a rule, encourage practicians in their professorial chairs, to the distinct disadvantage of the pupil, who is too often regaled with a fare of what Mr. A. says that Mr. B. has said. In mechanical engineering, for instance, the lectures of Dr. Coleman Sellars delivered to the students of one of the American colleges of engineering teem with information of a practical nature. Business and commercial matters also receive attention, and the student is reminded of the well-known American method of defining an engineer as a man that can do well with one dollar what any fool can do badly with two. This question of cost is always kept carefully in view on the other side of the Atlantic, and in this respect it would be difficult to surpass much of the recent work on the Canadian Pacific, where thoroughly substantial structures have been erected at a remarkably low cost. In American text books the importance of giving some idea as to costs has always been kept in view. Even the engineers' pocketbooks published there follow suit, very many approximate prices appearing in Trautwine, for example.

Technical education is only one weapon, though an important one, in the industrial battlefield. Common sense and courtesy in the counting house and business offices are at least equally essential. In dealing with countries using the metric system, quotations should not be made in English weights and measures, whilst the advantages of a set of standards generally recognized in the trade are well shown in the recent orders sent from Johannesburg to the States for iron piping. Formerly this was obtained entirely from the Clyde, but the different makers had all their own standard sizes for couplings, unions, etc., with the result that a batch of such goods received from one Scotch firm could not be used interchangeably with the goods supplied by another. American makers have agreed on a set of standards, to which all work, and for this reason only they are getting a large share of the South African trade. When complaints were made the Scotch firms defended themselves by the inane remark that their own fittinggs were interchangeable *inter se*, and they professed to be unable to understand why this was insufficient. Not so very long ago certain makers held similar ideas as to screw threads. In short, they rather thought they scored a point in having their own standards, as they fondly imagined that then all repairs must be returned to them for execution. Experience has, however, shown that a careful colonial importer avoids placing his orders with such firms, as the annoyance of having to send some thousands of miles to replace a broken bolt can only be balanced by a very substantial saving in the original cost of the goods. No amount of technical training in the designing department is likely to affect the practice of such firms, who can only be brought to take a common sense view of the matter by the hard logic of facts.

Guldlin's Valve Mechanism for Water Gas Apparatus.

On September 15th U. S. Letters Patent (No. 567,709) were granted to Mr. O. N. Guldlin, of Fort Wayne, Ind., for certain improvements in valve mechanism for water gas apparatus. Using the words of the specification :

This invention relates to connecting pipes and valves between a water gas generator and the superheater or fixing chamber, and more particularly to the valve operating mechanism.

My present invention is an improvement upon the combination valve connection described and claimed in my patent, No. 510,506, dated December 12th, 1893, in which the gas escape pipes leading, respectively, from the top and bottom of the generator are each provided with a valve. which are connected to the opposite ends of a centrally pivoted operating lever, the valves being so adjusted and arranged that one counterbalances the weight of the other, and so that one cannot be closed without opening the other, for the purpose of permitting at all times a free escape of gas or products from the generator to the superheater.

The object of my present invention is to provide for conveniently and quickly operating large, heavy valves in the gas escape pipes leading respectively from the top and bottom of the generator, and also to provide suitable connections between the rods of the respective valves, to insure that when one valve is closed the other shall be opened, in order that a free passage may at all times be provided for the escape of gas or products from the gas generator to the superheater and thereby prevent any accident which might be caused by the closure of both valves at the same time.

The matter constituting my invention will be defined in the claims.

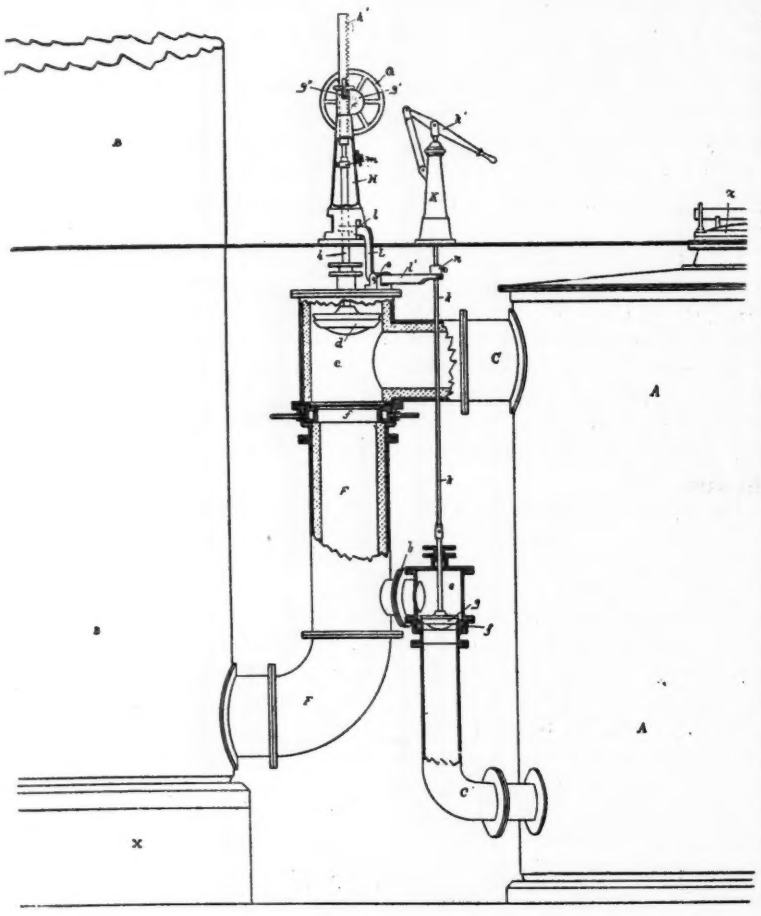
The details of construction of my improvements are shown in the accompanying drawing, in which the apparatus is shown partly in side elevation and partly in vertical section.

The gas generating furnace *A* is of the usual construction, and in practice is provided with the usual airblast pipe, steam supply pipes at top and bottom, and ash door (not here shown), and at the top with a fuel opening and tight fitting lid *x*. Gas escape pipes *C* and *C'* connect, respectively, with the top and bottom of generator *A*, and also with the gas delivery pipe *F*, which connects with the bottom of the superheater or fixing chamber *B*. A cylindrical valve chamber *c* is connected between the eduction pipe *C* and the delivery pipe *F*, and is preferably provided with a hollow annular valve seat *f*, provided with inlet and outlet pipes for the circulation of water or steam. The pipes *C* and *F* and valve chamber *c* are preferably lined with firebrick, as shown. The lower gas eduction pipe *C'* is provided with a valve chamber *e*, which connects by a short pipe *b* with the delivery pipe *F*. The valve chamber *e* is provided with an annular valve seat *f'*. In the valve chambers *c* and *e* I preferably use the ball or hemispherical valves *d* and *g*, adapted to fit tightly upon their respective seats *f* and *f'*, and said valves are provided with stems or rods *h* and *k*, passing, respectively, into stands *H* and *K*. The valve stem *h* has secured to its upper end the toothed rack bar *h*, which is guided in the stand *H*, and has meshing with it a pinion *g'*, upon a short transverse shaft having at its outer end a hand wheel *G*, said shaft being suitably journalled in the stand *H*. A locking pin or catch *g''* is provided for engaging with the rack bar *h'* for holding it in any desired position, so that the valve *d* may be held in a raised position or may be locked upon its seat. The rod *k* of the valve *g* passes up through stand *K*, and is pivotally connected at the top to the quick operating lever *k'*, which at one end is pivotally connected to a link which is pivotally connected to the stand *K*, as shown.

The rods *h* and *k* of the two valves are loosely connected through the medium of the bent pivoted lever *L*, and each rod is provided with an adjustable tappet *m* and *n*. The bent lever *L* is pivoted to a short stand *o*, and has an upper arm *l* and a lower arm *l'*, each of which arms is in practice slotted or forked to embrace the valve rods *h* and *k*, as shown. The adjustable tappets or collars *m* and *n* are secured by set screws upon the valve rods *h* and *k*, so as to be above the ends of the lever *L* and in such relative positions that the closing down of either one of the valves will cause one of the tappets to bear upon one of the arms of the

bent lever and automatically open the other valve before the valve which is being forced downward is fully closed. One of the valves having been raised from its seat by the operation of forcing down the other valve through the medium of the collar on the valve rod which is being forced down bearing upon the end of the lever *L*, then the other valve is fully raised in its box by means of its own operating mechanism. This mechanism and method of operating it are particularly desirable in the case of large or heavy valves.

In the manufacture of gas the valves will be operated as follows: When it is desired to blow up the fuel for heating it to incandescence by admitting a blast of air at the base of the generator *A*, valve *g* is closed, and during this operation the tappet or collar *n* on rod *k* will strike against the end *l'* of the bent lever and cause the other end *l* to strike against the collar *m* on rod *h* and raise the valve *d*. Should the valve *d* be too heavy to be raised from its seat by the above operation, it will have to be raised by means of the hand wheel *G* and pinion *g'* engaging with the rack bar *h'* before valve *g* can be tightly closed upon its seat. Valve *d* will be held in its raised position by means of



the lock *g''*. The products of combustion now pass from the generator through pipes *C* and *F* into the superheater, where they heat the brick checkerwork in the usual manner. The generator and superheater being heated to the proper temperature, the airblast is shut off, and gas can now be made by an up run; that is, by admitting steam below the grate or at the base of the generator and passing it up through the fuel, where decomposition takes place and the resulting water gas passes off through pipe *C*, valve chamber *e*, and pipe *F* into the superheater.

After a subsequent heating up of the generator and superheater by the airblast, as above explained, gas may be generated by a down run, and for this purpose the valves must be reversed from the position shown in the drawing. Valve *d* is closed downward upon its seat, and during its descent the collar *m* on rod *h* strikes the end *l* of lever *L*, and thereby causes the end *l'* to strike against the collar *n* on rod *k* and raise the valve *g* from its seat, so that an opening is made from the generator to the superheater through the valve box *e* before valve *d* is closed upon its seat. Steam may now be admitted at the top of generator *A* and pass down through the body of incandescent fuel, resulting in its decomposition to form water gas, which is passed off through pipe *C*, valve chamber *e*, and pipe *F*, into the superheater *B*. The valve *g* may be fully opened by hand lever *k'* and locked in a raised position by any suitable locking device.

It will thus be seen that my pipes and valve connection between the generator and superheater provide for making both up and down runs through the generator, and for conducting the gas at will from either the top or bottom thereof to the superheater without the possibility of both of the eduction pipes and valves being closed at the same time, and thereby preventing any explosion or other accident which might occur if there were not at all times a free passage for the gas or products of combustion from the generator to the superheater.

Having described my invention, what I claim and desire to secure by Letters Patent is—

1. The combination with the generator and superheater and gas eduction pipes leading respectively from the top and bottom of the generator, and each having a valve chamber, of suitable valves in said chambers, rods as *h* and *k*, connecting with said valves, independent means for raising and lowering each of said rods, and a pivoted lever engaging at its opposite ends with said valve rods, whereby one valve must be raised from its seat before the other is forced to its seat, substantially as described.

2. The combination with a generating furnace having eduction pipes at top and bottom thereof and said pipes having valve chambers, of suitable valves in said chambers having rods as *h* and *k*, means for separately raising and lowering each rod and valve, adjustable tappets or collars *n* and *m*, on said rods, and a lever as *L*, pivoted between said rods with its ends below said collars, and adapted to be engaged or borne upon thereby, whereby the closure of one valve will cause the other valve to be raised from its seat and always provide a free escape passage through one of the pipes leading from the generator, substantially as described.

Dixon's Gasholder for Railway Coach Lighting.

On September 15th U. S. Letters Patent (No. 567,764) were granted to Mr. Robt. Munn Dixon, of East Orange, N. J., for "certain new and useful improvements in gasholders for railway cars or the like." Using the words of the specification:

The object of my invention is to produce certain improvements in gas lighting systems especially designed for railway service in which the gas to be utilized is stored under high pressure until required for use. In systems of this description it is necessary to reduce the high pressure gas to a pressure low enough to render it available in the usual burners, for example. This reduction of pressure is usually accomplished by what is known in the art as a "regulator."

Heretofore where regulators for railway car service have been employed they have been connected to the receiver by pipes, for example.

Broadly stated, my invention consists in the incorporation of a regulator into a receiver, thereby dispensing with much of the piping now employed, in that way simplifying the system and at the same time completely protecting the regulator by the heavy walls of the receiver and making it impossible in an ordinary accident for any gas to issue from the receiver except under low pressure, in which state it is comparatively harmless.

The specific features of my invention, as distinguished from its generic form, will be hereinafter defined in the specification and succinctly set forth in the appended claims.

In the accompanying drawings, Figure I. is a side elevation of a portion of a car, with one of my receivers attached. Fig. II. is a central vertical section of one end of a receiver with the regulator shown in elevation. Fig. III. is a transverse section thereof, looking toward the regulator. Fig. IV. is an end view of a modified form of my invention. Fig. V. is a transverse section thereof, taken through the regulator, with the operative parts of the regulator, except the flexible diaphragm, omitted.

Referring to the figures on the drawings, 1 indicates the body part of the receiver, being preferably a cylinder of heavy plate metal.

2 indicates one head thereof, and 3 the other, the heads being secured to the body part, as by tap bolts 4, serving to securely unite the heads to the body part by gastight joints.

5 indicates brackets secured to the heads by rivets 6, by means whereof the receiver may be secured to hangers 7, that suspend it from the under side of the car body 8.

9 indicates a gas supply inlet, the outflow from which is controlled by any suitable valve mechanism, as, for example, an ordinary gravity check valve 10.

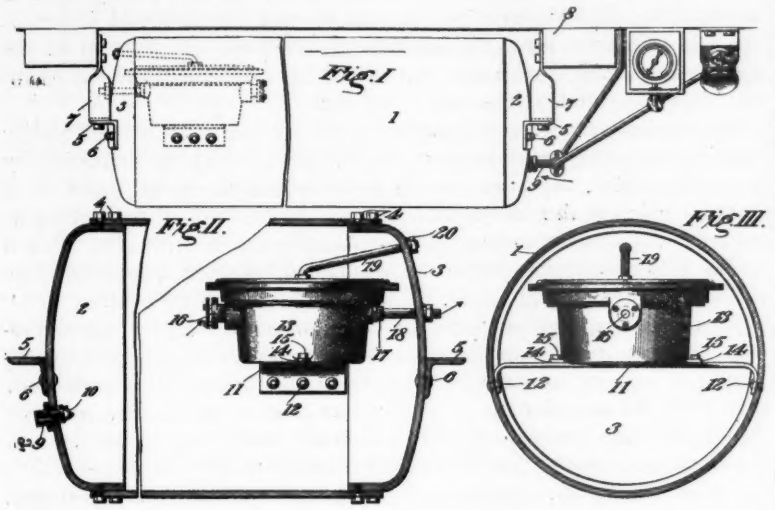
11 indicates a bridge secured, as by rivets 12, to the opposite sides of the cylinder 1 near the head 3.

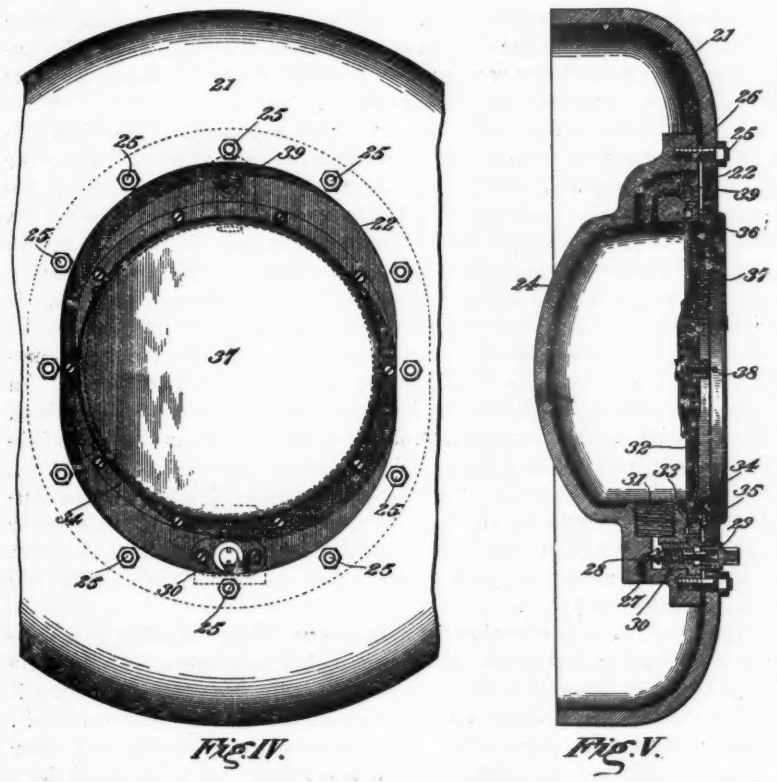
13 indicates any suitable gas regulator, which may be provided with lugs 14, by means whereof bolts 15, extending through openings in the same and screwing into the bridge 11, may firmly secure the regulator in place within the receiver.

The details of the regulator, being perfectly understood in the art and

constituting no part of my invention, are not illustrated. It is deemed sufficient for the present purpose to specify that the regulator is provided with the usual regulator inlet 16 and low pressure outlet 17, the regulator inlet opening directly into the receiver, while the low pressure outlet communicates, as by a pipe 18, passing through the wall of the head 3, with the lamp system or other pipe system (not illustrated) of the car.

19 indicates a pipe communicating at one end with the interior of the regulator above the diaphragm and extending through airtight connection 20 at the other end to the outside of the head 3, and which





serves to insure atmospheric pressure only on the upper side of the diaphragm, thereby securing the proper automatic regulation of the degree of pressure through the low pressure outlet 17 and pipe 18.

Let it be observed in this connection that the regulator is entirely surrounded and protected at all points by the heavy walls of the receiver.

If it should become necessary to repair the regulator in any wise, the bolts 4 may be unscrewed and the head 3 taken out for that purpose.

In Figs. IV. and V. of the drawings I illustrate a modified form of apparatus. In these figures the head of the receiver (indicated by 21) is provided with a circular opening 22, concentric with the axis of the cylindrical receiver. Within this is a concave or dish shaped head 24, secured as by bolts 25, an annular gasket 26 being secured between the edge of the head 24 and the head 21 to insure a tight joint. The wall of the head 24 being of equal thickness with that of the head 21 the strength of the receiver is unimpaired, and on account of its shape the regulator located within it is entirely protected by it. The annular wall of the head 24 is preferably cast thick enough to accommodate a high pressure inlet 27, that is controlled by a conical valve 28, whose stem 29 may be turned by a wrench from the outside of the receiver, as required. A bushing 30 may be employed between the metal of the head 24 and the valve stem 29.

31 indicates an internally screw threaded socket within which the nipple of the regulator valve mechanism (not illustrated) may be screwed. The valve mechanism of the regulator proper is, as above suggested, purposely omitted, the only portion thereof which is shown being the well known flexible diaphragm 32, that is secured against the annular face 33 of the head 24, as by a ring 34, and its intermediate gasket 35. The ring 34 preferably carries a rim 36, to which may be screwed a cap 37, the cap 37 being provided with an air hole 38, corresponding in office to the pipe 20 above mentioned.

By the employment of the dish-shaped head 24 and the cap 37 the regulator is entirely incorporated within the receiver and is as fully protected thereby as in the form of embodiment of my invention shown in Figs. I. to III., inclusive. I prefer the form shown in Figs. IV. and V., however, because of the facility with which access to the interior of the regulator may be gained for repairing or adjusting the mechanism.

39 indicates the low pressure outlet, which establishes communication between the interior of the regulator and the lamp or pipe system, supplying gas from the former to the latter under low pressure.

What I claim is—

1. The combination with a gas receiver, of a pressure regulator incorporated within the same and protected by the walls thereof, substantially in the manner and for the purpose specified.

2. The combination with the gas receiver, of a pressure regulator inclosed within the same, and having its exterior pipe connections embodied within the walls of the receiver, substantially as set forth.

3. The combination with a gas receiver, and pressure regulator contained therein, of a high pressure gas inlet communicating with the regulator and opening directly into the receiver, without any intervening connection of any kind, substantially as set forth.

4. The combination with a gas receiver head and opening therein, of a dish shaped head, means for securing said parts together, and pressure regulating mechanism carried within the dish shaped head, substantially as set forth.

5. The combination with a gas receiver head, dish shaped head secured thereto, and pressure regulating mechanism therein, of a low pressure outlet opening from the face of the dish shaped head, a high pressure inlet formed in the wall thereof, a valve controlling the high pressure inlet, and mechanism for operating said valve on the outside of the dish shaped head, substantially as set forth.

6. The combination with a gas receiver head, and dish shaped head secured thereto, of a high pressure inlet and low pressure outlet in the wall of said dish shaped head, and a flexible diaphragm secured across the face of the dish shaped head, substantially as set forth.

7. The combination with a gas receiver head and dish shaped head secured thereto, of a high pressure inlet and low pressure outlet in the wall of said dish shaped head, a flexible diaphragm secured across the face of the dish shaped head, and a cap secured to the wall of the head and covering the diaphragm, substantially as set forth.

8. The combination with a receiver head, dish shaped head secured thereto, and a high pressure inlet and low pressure outlet in the walls thereof, of an annular face upon the dish shaped head, a ring, means for securing the ring to the face, a flexible diaphragm secured between the ring and the annular face, and a cap secured to the ring, substantially as set forth.

The Revivification of Oxide of Iron.

Some time ago Dr. W. Leybold, of Hamburg, prepared a paper on the matter of the revivification of oxide of iron, and subsequently the London *Journal* printed the following abstract translation thereof:

The revivification of oxide which has been used for the purification of gas is one of the most notable processes of inorganic chemistry. The oxide used is most generally bog ore, but is sometimes an artificial material. After fouling it contains some free sulphur and iron sulphide; and "revivification" consists in the conversion of the latter into sulphur and hydrated iron oxide by the action of moisture and air under certain conditions. There is a trifling amount of ferrous sulphate also formed. The fouled oxide, when removed from the purifiers, is spread out in layers about 18 inches deep. Shallower layers are less favorable to the process. The temperature of the mass rises, and, even in the presence of an ample amount of moisture, it may reach from 140° to 160° F. When the atmospheric oxygen has penetrated throughout the heap, the process is becoming complete, and the temperature begins to fall. To promote the action the heaps are stirred so that the air has access to all parts. If the layer be too shallow, or if it be very cold, the

process is hindered. If there is an ample store of oxide, the revivified mass will not be put into the purifiers within a week from the time it it was taken out in a fouled state, and this interval will have sufficed for the change to be quite completed. But where store space is limited, or the stock is low, it may be desired to use the oxide again in less than a week, and the gas works chemist will frequently have to say if it is completely revivified.

A method of answering this query has been devised, based on the measurement of the sulphureted hydrogen evolved when oxide which is not wholly revivified is treated with hydrochloric acid. If revivification be complete, hydrochloric acid will not cause the evolution of a measurable quantity of sulphureted hydrogen. The course of the revivification can be traced by testing samples (taken from below the surface of the heaps) at intervals. If the amount of sulphureted hydrogen evolved from a given weight of the oxide immediately it is removed from the purifiers be taken as 100, daily tests of the same weight of material will show the percentage of foul oxide remaining. For example, 100 grammes of fouled oxide gave 974.4 c.c. of the gas. The mass was raked over twice during the next day, and 100 grammes then gave only 162.5 c.c. of gas. After similar treatment of the mass on the third day, 100 grammes gave only 14 c.c. of gas. No gas was found on the fourth day, and the revivification was therefore quite completed by that time. Even on the second day, a sample taken from the surface of the heap developed no gas.

The tests may be conveniently carried out by the aid of a wide-mouthed bottle, with caoutchouc plug, connected, by means of glass and flexible tubing, with a graduated measuing tube open at the bottom, and immersed in a cylinder filled with water. Dilute hydrochloric acid is placed in the bottle, and a small vessel containing the weighed sample of oxide is carefully stood within it. The plug is put in, and the vessel containing the oxide is overturned into the acid. The sulphureted hydrogen evolved displaces water in the measuring tube, and the volume is read after adjustment of the water level. A Bunte burette may replace the simple open measuring tube, and the water level may be adjusted by connecting, by means of flexible tubing, the nozzle of the burette with a small vessel containing water. The burette is, however, too small for the gas evolved from 25 grammes of oxide, which is found a convenient weight on which to operate in most instances, when the material is fresh from the purifiers Under these conditions about 250 c.c. of sulphureted hydrogen is evolved.

In order to gain further knowledge of the course of the revivifica tion, lead piping was inserted in a heap of fouled oxide, so that it reached to the middle of the heap. Through it a sample of gas was aspirated each day, and analyzed. The results were as follows:

	Volumes per Cent.						
	First Day.	Second Day.	Third Day.	Fourth Day.	Fifth Day.	Sixth Day.	Seventh Day.
Carbonic acid.....	0.1	0.6	0.5	...	...	...	...
Heavy hydrocarbons.	0.7	...	...	...	...	...	...
Oxygen.....	0.4	0.5	4.0	16.0	19.0	20.0	20.4

On the third day, when 4.0 per cent. of oxygen was found, tests showed that 97.5 per cent. of the material was revivified; while on the next day, when 16 per cent of oxygen was present, the material was virtually completely converted. Thence the oxygen rapidly rose until the percentage was practically that in the open air. Therefore we have both direct determination and the estimation of the oxygen present in the gas in the interstices of the mass, as methods of ascertaining whether spent oxide has completely revivified.

Power from the Trolley Circuit--Is It Practicable? Why do the Fire Insurance Companies Object?

[A paper read by MR. H. S. NEWTON before the New York State Street Railway Convention.]

An experience of several years in the erection and operation of power stations has led me to the conclusion that the chief point of interest connected with them in the eyes of the management is the relative size of their coal bills. Witness the appearance and universal adoption in our modern stations of the compound condensing engine, built in the Corliss and other most economical types where the non-condensing slide valve was good enough a few years ago, and you see the effect, not of a desire to appropriate the results of engineering progress and thus be in fashion, but of an effort merely to bring about a reduction in the number of cars ordered from the coal dealer.

In many sections of the country the saving of a ton of coal per day is equivalent to the interest on $20,000. If a device costing, say, $15,000 to install and operate, will accomplish this saving, it is clearly to the advantage of the street railway manager to install this device. And as a consequence of the realization of this fact, the railway power station is to-day a combination of all that is economical in steam construction.

To a marine engineer, or to an engineer accustomed to the steady load encountered on shipboard, a glance at our engine rooms, when they are running under average conditions of service, must naturally, however, be surprising. He must, if he is a man of an inquiring disposition, feel some anxiety to find out why often half the available horse power of the station is not in use, but instead is lying idle, a monument to several hundred thousand dollars in capital expended in its erection. The explanation that the several engines and dynamos are held in reserve for extra demands of traffic may satisfy him in the engineering sense, but cannot fail to call up questions as to the financial wisdom of such a condition of affairs.

To the electric railway manager who is striving with all his ability to bring operating expenses down to the limit which is prescribed by the best practice, any plan looking to the utilization at all times of at least a portion of this idle machinery, and to the knocking off of a percentage of his power account, must naturally appeal strongly. If such a plan does not involve further expenditures for extra apparatus, it appeals still more strongly, and, if practicable, may be adopted.

In some cities in other States the best plan for accomplishing this result has been found to be the sale of surplus power outside, or the supplying of current for manufacturers from the trolley circuit. In our own State the adoption of this plan has been attended with so many difficulties, and has been subject to so many provisions at the hands of the insurance people, that I believe it is only in rare instances that it has been tried at all, and then only at the solicitation of the customer.

It has been recognized as a possible and highly practicable source of income by railway men generally, but a systematic move has never been made to compel the insurance companies to modify their rule covering the case, with the consequence that the rule still remains and our surpluses of power are still undisposed of.

It is my intention to first point out to this convention the chief advantages possessed by our railway systems as producers of power for private consumption, and then to follow with a statement of the objections raised by the Board of Fire Underwriters and others toward its adoption throughout the cities of New York State. Hitherto the electric light station has figured as the chief factor in the production of power for stationary motors. It is too often hampered, though, by circumstances of small units and insufficient reserve to consent to take hold on a large scale of a business necessarily offering what is, compared with that accruing from lighting, a reduced margin of profit. In lighting stations, too, employing large engines driving many machines, the variation in load always attendant on the use of motors is also objectionable from the fact that the lights are affected to some extent. In these particulars the railway station is prepared. The compound condensing Corliss engines which are showing themselves in all our power stations, are run at an economy of coal consumption which converts what would seem a very poor price for power into a figure containing a neat margin of profit.

Take for example a station in one of our cities, containing a 1200-horse power direct-coupled Corliss engine held in reserve and estimate what could be done with the engine and its attached generator were it thrown into active duty on a private consumer's power circuit. Figure on an investment of $75,000 in the engine, generator and other apparatus relating to the two. Then assuming coal to be worth $3 a ton, and the engine to have a fuel duty of 3 pounds per horse power per hour, we have coal consumed for each day of 10 hours; 18 tons at $3, $54.00; cost of labor, engineer, fireman and oiler, say $10.00; oil and waste, $2.00; incidental repairs, $10.00, $76.00. Add to this 10 per cent. depreciation for one day, $20.55; interest on the investment at 5 per cent., $10.27; total, $106.82.

Then figuring on an ability to sell the output for 10 hours in the day at 2¾ cents per 1000 watt-hours, we have 1200 horse power for 10 hours, equals 8,952,000 watt-hours at 2¾ cents, equals $246.18.

With cost of production as stated above, the net profit amounts to $139.36, a very fair sum to go toward reducing operating expenses.

I think it has been abundantly demonstrated in the past that long lines of shafting for mill work are the cause of an enormous waste of energy, and on that account alone, I am sure that there are numbers of the smaller mills in our cities which would save money if they rented their power at a reasonable rate from a railway company. The recording wattmeter has been brought to a high state of perfection, and by its aid there is no necessity for the consumer to pay for one iota of current more than he uses. Then he can divide up his factory

among several smaller motors, can run one or all of them, as occasion may demand. This, too, with an outlay which should be inconsiderable compared with what the electric light companies would be compelled to charge were the power obtained from their circuits.

This plan would be feasible not only for shops using the very smallest of units, but it might be just as profitably considered by manufacturers using at present 50 or 100 horse power steam plants and employing their own engineers. At 2¾ cents per 1000 watt-hours, were there 50 horse power used uninterruptedly during the day, the charge would be a little over $10, while the presumption is that were a small engine and boiler used to move line shafting for the same shop, the inferior economy of the steam plant, plus the increased power necessitated by loss in friction, would more than over-balance in cost the bill sent in by the railway company.

The small outlay required by the railway company in reaching consumers is another point to be urged in favor of supplying power from the trolley circuit. It is a noticeable fact that street railway engineers are providing much more liberally for their trolley feeders to-day than they did on the introduction of electricity as a motive power, and in consequence our lines are so well fed that the abstraction of a small percentage of power for outside use would hardly be noticed in the running of the cars. Then the close proximity of the feed wires on the railway circuits, and the short taps and small expense required to connect them to factories, would be a strong card in the eyes of the consumer.

The objections as advanced by the Board of Fire Underwriters to the use of trolley circuit for stationary motors seem to be embraced in one feature, the ground return.

The insurance man will relate to you long tales of the disastrous effects produced where the experiment has been tried, will suggest to you that you build a fireproof house outside your building to hold your motor and run your machinery inside by means of a belt and line shaft (the very thing you do not wish to do), and will conclude by assuring you that if you will install a motor on the plan proposed, he will have to increase your rate by 2 per cent. on the face of your policy. This, he claims, is because a reliable method of insulating has not been discovered to make the installation a good risk.

Over in Syracuse we are using for supporting our various lines some 400 or 500 iron poles. Every pair of poles is to the trolley wire suspended between them a dead ground, and yet in the last three years, during which time I have held my position on the street railways there, we have never had one ground on these poles. And yet these insurance men tell us that they cannot find an insulation secure enough to warrant their insuring a building into which the trolley circuit runs, with every precaution taken for most careful insulation, without an addition to the premium such as I have noted. It is true, undoubtedly, that results speak, especially in the insurance business, and there is little reason to doubt that a great many disastrous fires have been started by the defective installation of electric light and power plants. It does not necessarily follow, however, that because a large percentage of these fires resulted from the contact of a current-carrying wire with a gas or water pipe, that a system of electrical transmission, between one of the wires of which, and the same gas or water pipe, no difference of potential exists by design, should be barred out. Ninety per cent. of the arc light circuits in our cities, if subjected to the gas pipe test, will show as great a capacity for kindling conflagrations as the much abused trolley circuit, and yet the arc circuits with their 3,000 to 5,000-volt difference of potential and their invariably grounded circuits come into all our buildings. With protected wiring and reliable insulators for holding the wires, both systems may be rendered absolutely safe, except as against criminal carelessness or evil design.

Caring for Steam Cylinders and Pistons.

By Mr. W. H. Wakeman, in the *Safety Valve.*

One of the proudest moments that ever comes to the young engineer, and also to him who is no longer young, provided he has any enthusiasm for the occupation that he follows, is when he first turns steam on to the new engine and watches the flywheel make its first revolution.

It is assumed, however, that before the throttle valve is finally connected to the steam chest, that steam has been blown through the main steam pipe, in order to remove all bits of iron, dirt and whatever red lead is found inside of the pipe, for such things are not wanted in a steam cylinder nor on a valve seat.

A large quantity of cylinder oil is used as a rule during the first day's run, and it is well to do this, for no engineer can afford to run the risk of cutting and scoring a new cylinder for the sake of saving a few cents' worth of cylinder oil, and yet I have often wondered if it were really necessary to do this. Those engineers who claim that it is not give as a reason for their belief, that while the tool marks are yet fresh, the oil will lodge in the channels so formed, and as a result there is less danger of cutting than when the surfaces are as smooth as glass, for then the oil may be swept off from them without performing the duty that it was intended for. I am quite sure that more old cylinders are scored for lack of proper lubrication, than new ones, but at the same time it must be remembered that a cylinder is new but a short time, while it is old for many years, consequently there is more chance for damage to be done in the latter case than in the former. As I have mentioned one of the proudest and most satisfactory moments that come to an engineer, I will also refer to one of the most unsatisfactory and humiliating that he finds in his experience, and that is when he removes the cylinder head from his bright, clean and apparently well kept machine, only to find that furrows are plowed from one end to the other of the internal surface of the cylinder, and that it will never be steam tight again until it has been rebored.

Fortunately for engineers of the present time, it is not necessary to remove engine cylinders from their foundations in order to rebore them, as any ordinary sized cylinder may be rebored after shutting down Saturday afternoon and be ready for use on Monday morning by the aid of improved machinery and methods of operation. If, however, the piston rings are badly worn, it will not be good policy to put them back into service after reboring the cylinder, for they will only touch it in spots, bringing much pressure to bear on small surfaces, thus greatly increasing the risk of damage at this time.

Some time ago a man visited our city, who made claims that would cause even a lightning rod agent to own himself outdone. He was selling a patent piston packing, which is one of the best that I ever saw and well worthy of adoption, but when the claim was made that, when put into an old cylinder that was worn out of truth, it would true it up in a few months without reboring, provided it was not badly worn at the start, it was startling to say the least. Now it is true that if a perfectly round piston packing is put into a cylinder that is not round, the wear of the rings will come upon the walls of the cylinder where the diameter is the least, and in this way the tendency will be to restore it to its original form, but to claim that it will do this perfectly is simply absurd, for, while the large surface of the cylinder is being worn down, will not the small surface of the rings suffer and thus be worn out of round before the desired object is attained?

If the engineer has decided to order a new set of packing rings for his engine or pumps, to be put in without boring out the cylinder, he should not trust to a measurement made with a pair of calipers and then laid out on a rule or scale, for although we have a standard for all linear measurements, still, all rules and scales are not made to correspond exactly with the standard, and even if they did, there would be a chance for mistakes, for it frequently happens that all men will not measure the same thing alike. The best plan is to cut a piece of wire for small cylinders and an iron rod for large ones, just the right length to represent the diameter of the cylinder in its smallest part and send it to the man that is to make the rings. This plan will lessen the liability to make mistakes. If the wire is accidentally filed too short, it may be lengthened by laying it on an anvil and striking it a few blows with a hammer. If it is laid on the finished part of the cylinder head or on the bright part of the frame or on the crank shaft, the same object will be attained, but where such abominable practices are indulged in, the whole plant soon has a dilapidated appearance which is far from being a credit to the engineer in charge. In a large sawmill in this vicinity the engine frame was so designed that the top of it was flat and it was planed and nicely finished. It was the practice of the sawyer to bring the big circular log saw up and lay it on this frame when he wanted to experiment with hammering it. The result may be imagined.

Even after all precautions have been taken to get correct measurements, it is not wise to assume that the rings are just the right size, for if they are a trifle large and are put in and the engine started up at once, a scored cylinder may be the result. If it is a direct-acting steam pump, it may refuse to run full stroke at first, on account of the rings binding on the small part of the cylinder. To obviate all trouble along this line, the piston of the engine or pump should be moved out to the cylinder head on the crank end, and the rings may then be put into the head end of the cylinder and carefully moved through the whole stroke of the piston. This will be satisfactory evidence that they are not too large. It will not answer to put them together at the head end

of the cylinder, and, because they are right there, assume that they will be at all other points of the stroke, for it frequently happens that the cylinder is worn larger at the ends than in the middle. If the rings are too large they may be made smaller by filing off the ends, thus allowing them to close together further, the effect of which is to slightly reduce the diameter.

Care should be taken, however, to avoid filing off too much at once. It is an easy matter to try rings in this way, provided they are made in one piece, as the snap rings are, but where they are made in six or eight pieces, it is more difficult, even if some plan is adopted to hold them in place temporarily, as, for instance, that of sawing out a piece of wood in circular form, or any other plan that may be suggested by the construction of the rings.

Many of these rings are so made that they must be held in place by spiral or flat springs, and these springs rest upon the bull ring. In these cases it is necessary to put the inner rings in place by the sense of feeling, as it is impossible to see where they go, except with large cylinders, so that a man can put his head and shoulders into them, so that instead of the ordinary figures stamped on them to designate where they go, I would suggest that notches be filed on the inner edges of the several parts where they can do no harm, for these can be felt with the fingers, and the engineer can be sure of their correctness even if he cannot feel them.

I believe it to be a good plan to slightly bevel the outer edges of piston rings with a fine file, so that instead of presenting a sharp, square edge to the oiled surface of the cylinder as they slide from one end to the other, the form will be in better shape to allow the oil to work under the rings, and provide good lubrication instead of pushing the oil before them.

It is the custom of many engineers to give the bull ring of their engines a quarter of a revolution at stated intervals in order to prevent it from being worn flat, as it would provided it were never turned. The objection to this practice is that by continual turning the bull ring is worn down to a smaller circle than the cylinder is, therefore, the bearing surface on the bottom is small, as any reader may demonstrate to his own satisfaction by drawing a circle of any desired size and then drawing another one inside of it of a slightly less diameter, but the inner one must rest on the bottom of the outer in order to correctly illustrate it. If the bull ring is never turned, it adjusts itself to the lower half of the cylinder and makes a perfect fit, then as the parts wear the piston may be kept central by use of the screws and jamb nuts provided for that purpose.

The objection to this plan is that the ring will form such a nice fit with the cylinder that it will exclude the cylinder oil and there will be great danger of scoring the cylinder in consequence.

Which of these two evils is the greater and hence to be avoided, and which of them is most likely to visit the unsuspecting engineer are open questions which may not be decided here, but inasmuch as I have adopted the plan of keeping the bull ring in one position during an experience of more than 18 years on different engines, with good results, I may be pardoned for believing that to be a good idea, although if all of that time had been spent in running one engine I might have arrived at a different conclusion.

Some engines are constructed with a brass shoe at the bottom of the piston on which the metal rests, and as it covers nearly one-half of the circle of the cylinder, it makes a very good bearing. This, of course, cannot be turned around, so that the engineer has no choice in the matter; but still, as we have brass riding on cast iron in this case and obtain good results, it may not definitely prove that with a cast iron ring riding on a cast iron cylinder, the same results will be secured. If the cylinder head of an engine is removed, say on the following day after the machine was shut down, and it is found that the internal surfaces are rusty in spots, the rust being of that light color and unstable consistency which denotes recent formation, it is a good evidence that the cylinder oil is unsuitable for the existing conditions, or else there has not been enough of it used to secure good lubrication, for, otherwise, there would be a coating of oil over the entire surface, which would resist the action of the moisture for a short time at least.

Two or three years ago we used to hear much about running an engine with one drop of cylinder oil per minute, but of late I have heard nothing of it. What was the matter with it? Is it still in use, or have some of our friends discovered that it was not a paying investment, all things considered?

A certain chief engineer in charge of a large plant thought it a good idea to economise in the use of cylinder oil, so proceeded to put his idea into practice, but in his zeal for a good thing he overdid the matter, and as a consequence the cylinders of his engines were badly scored. This naturally caused him to go to the other extreme, and so much cylinder oil was disposed of during the next six months that the company began to fear that their usual dividends would be dissolved in oil, and when the matter came up for consideration it became a weighty factor in deciding that he must be removed and another man put in his place. This may be called an extreme case, and it probably is, but it goes to show that while it is well to be economical with supplies, still there is such a thing as false economy here, as well as in other places.

It is true that unless the rings are properly adjusted it matters little whether a large or a small quantity of cylinder oil is used, for where short, flat springs are used they may easily be made so stiff that undue friction will result in a scored cylinder, and the same trouble may be secured by the careless adjustment of set screws, which control these springs. One advantage of the famous Dunbar packing rings is that they are held in place by what may be termed "hoop springs," because they are made of pieces of steel wire bent into the shape of a hoop (except that the ends are not welded), and with this kind it is almost impossible for a careless or ignorant engineer to set them out hard enough to damage the cylinder, or even to create excessive friction.

In cases where through a miscalculation the counterbore has been made too deep, so that these rings travel over it far enough to allow the steam pressure to act on a portion of the outside of the rings, they may collapse, and thus make a loud noise as each center is passed, and to overcome this objection small holes are bored through the piston and also through the follower plate, to admit steam to the under side of the rings in order to hold them up. If this is done care should be taken that the holes are not too large, or that there are not too many of them. For a 10-inch cylinder four holes about one-eighth of an inch in diameter will be about right, for only just enough should be admitted to keep the ring from collapsing, and if not enough are put in the first time it is an easy matter to put in one or two afterward. If more are put in than are necessary the rings will be set out too hard and the cylinder will be worn more rapidly than is necessary, and if it is an automatic engine, working with a short cut-off, the wear will be greatest at each end of the cylinder, and much less at the center, for after the cut-off has taken place, expansion begins, the pressure is reduced, and the springs are relieved. This is the reason why these holes should never be put in unless they are absolutely necessary. It will be understood that the steam admitted through these holes is not blown through to the other side and lost, but is only admitted to the space between the underside of the packing rings and the bull ring, and that it expands with the rest of the steam, and as said space is filled with compression of exhaust steam it cannot be considered much of a loss.

It sometimes happens that even with a horizontal engine the cylinder will be worn more on top than on the bottom, and the causes of it have been discussed many times, for it appears to some as if the weight of the piston would wear on the bottom and nowhere else. This would probably be true if the piston was moved under the same conditions that exist when the cylinder head is off while the engineer examines the internal parts, but it is not. If it were drawn back and forth by the crosshead, then the weight would be a large factor, but to what extent does it have a bearing on the case when the piston is driven by steam at a high pressure?

Suppose that we take a stick of wood of any convenient size, say one inch square and four feet long; put one end of it against a wall, place the palm of our hand against the other and then push. What effect does the weight of the stick have in this case? Practically none, and the same principle will apply to a steam piston in operation, for although the weight is heavier, the pressure is greater accordingly. The illustration is not claimed to be a parallel case with the piston, but the same principle will apply in a greater or a less degree.

A great many dollars' worth of steam are lost through improperly constructed and worn out pistons, and it is for the best interests of every engineer to stop all such leaks without delay.

Modern Tools and Engineering.

The Engineer, in the course of an article on the subject named in the heading, which should be brought by his employer to the attention of every working engineer in the country, says that if engineers of the present day realized how much their labors and anxieties have been lightened by better machine tools, better oils and better methods of lubrication than their forefathers had, we think they would vote a set of resolutions to the persevering men who introduced these things. We said better machine tools, and this applies directly to engineering, for

the lathes we had 50 years ago were but ill adapted to their work, while the methods in use in those days of preparing work to be turned on them would not be tolerated now. Such a thing as a center drill was unknown in the best and largest machine shops of the country, and as for countersinking a centered shaft, it was never done, except in the case of very heavy shafts, and then more to afford a bearing for the lathe center than from any idea of its great importance in accurate work. Even the lathe center itself was but little considered: it was, more often than otherwise, a stubbed, any-angled plug in the lathe spindle, with a point upon it that had seen as hard usage as a boy's peg top, and it was never turned up true unless there was absolutely no getting along with it. When work was taken out of the centers before it was finished, for any purpose, wise men chalked the center and the work so that they could be sure that the job went in at the same place it came out of.

These practices will sound queerly to latter-day machinists who have tools of precision that require no such precautions; but we have only told a plain tale of the way lathe work had to be done half a century ago, not in a cross roads country blacksmith shop, but in this city of New York, in the largest shops, with the best tools extant at that time.

As may be imagined, the bearings turned in such lathes and by such methods were polygonal, not round, and if they were concentric, where two bearings were on one shaft, it was because the latheman was smart enough not to turn the shaft end for end in the lathe, and did not use a steady rest unless he was compelled to.

Fitting a brass box to a polygonal journal is an impossibility, as fitting is now understood, and it was fortunate for the engineers of the period that the piston speeds were slow and the pressures low, otherwise they would have had much more trouble than they did have with hot bearings. Imagine a modern torpedo boat or high speed yacht, with engines fitted up as we were compelled to fit them 50 years ago, driven by high pressure steam! Such an engine would not have run half an hour, if, indeed, it stayed in the boat.

Modern machine tools are instruments of precision in all senses of the word, and work turned in them by skilled lathesmen is practically round in itself, but approximate rotundity, or truth, will not answer for the work that steam engines are called upon to do in these days of high piston speeds, and the best engine builders use grinding machines, where practicable, which make absolutely straight cylindrical bearings.

Grinding, as practiced 50 years ago, consisted in smearing the surface of the pin to be ground with flour emery and inserting it into the detail it had to fit tightly. The pin was then rotated back and forth until the highest parts were ground off and it would enter and fit the hole without shaking in it. This was a crude, rough process, and in no wise like modern grinding. The pin or shaft to be made true is put between dead centers and revolved upon its own centers, which are carefully and accurately made in the first instance, then an emery wheel of very fine grade traverses back and forth over the surface, just skinning the highest parts, until the whole is a true surface. This process reveals the fact that the best modern lathes and lathesmen cannot turn a bearing absolutely true, for if a piece is smoked so as to leave the surface black, and then put in the grinding lathe, the first cut over reveals the fact that it is very far from being true. If this is correct of the best modern lathes and with work properly centered, we may imagine what the surfaces produced in old-time lathes were when there were no centers, as we may say. Three and four hundred revolutions per minute for engines exerting 2,500 to 3,000-horse power per hour have been attained recently, while in the case of smaller high powered engines, 600 revolutions and even more have been made by modern steam engines. For such rotative speeds the utmost accuracy of machine work that is possible must be present, and modern machine tools have a large share in producing it.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, September 10th, 1896.

Water Gas—London Water Supply—The Prepayment Meter—The Gas Stove and the Fire Grate.

Water gas continues to find favor amongst those gas engineers—fortunately a fairly numerous class at present—who find themselves called upon to provide for a substantial increase of business. Given a steady supply of oil at a moderate price, it appears an established fact that a large additional demand can be met more cheaply with the aid of the generator, carbureter and superheater than by means of the orthodox furnace and retorts, besides securing other advantages which are too well known to need repetition here. An installation of water gas plant was put into operation at Brighton early this year, and was referred to in the directors' report to the shareholders as having yielded results in actual working that were fully equal to those expected. And a few days ago a set capable of producing 750,000 cubic feet per day was started at the Southport Corporation Gas Works by the Mayor, who stated that although only two years had elapsed since the first introduction of water gas apparatus on the commercial scale into this country, it was now in operation in 20 different gas works, and the aggregate production was 30 million cubic feet per day. The plant is a duplicate set, capable of being worked singly or together, and the building in which it is erected is adapted for the reception of a second set when required. It is located at one end of the retort house, with arrangements for delivering hot coke straight from the retort to the generator, which is another case of the consumer being supplied directly from the producer, thus saving the middleman's profit. So the objection that was recently made against the water gas plant at Liverpool, that the coke had to be brought from another gas works at a distance, does not apply at Southport. It is considered that this addition to the plant has been carried out at a cost of £11,000, and that a set of coal gas apparatus of similar capacity would cost £20,000. Southport is one of those few places where, as at Liverpool, it is obligatory to supply a gas of higher candle power than can be produced from ordinary bituminous coals, and the question of enrichment, therefore, has a practical value that does not obtain in other places. They have to supply over 20 candle power, and were therefore, till recently, at the mercy of vendors of high class cannels.

From water gas to water supply seems a natural step, and I therefore turn next to a few details concerning the London water supply which at present appears to be in a very unsatisfactory state, at least so far as some of the crowded and poor districts at the East end are concerned. London ratepayers are under the unfortunate necessity of having to support several public bodies for the ostensible purpose of looking after their interests, and I don't pretend to say how far they are successful in this respect, but they certainly have the effect of causing a great deal of expense, and occasionally leading to much inconvenience and ill-feeling. One of these bodies is called the London County Council, and amongst other things it has looked with covetous eyes on the property of the London Water Companies for some years. It has sought, with this end in view, not only to prevent the increase of capital, but to prejudice the value of that already existing, but fortunately for the Companies, the Acts of Parliament, on the faith of which the enormous capital invested in reservoirs, wells, pumping stations, mains, etc., was raised, cannot be driven over roughshod. The Companies have repeatedly asked for permission to increase their plant in proportion to their rapidly increasing demand, but have been hampered by the opposition of the London County Council. The consequences, during the recent dry season, can well be imagined. There has been a shortness of supply, the effect of which has been accentuated by the fact that several districts have been placed under what is called the constant supply system, and the tenements have absolutely no storage capacity whatever. The efforts to arouse ill-feeling against the Companies naturally have their effect amongst the consumers, who think it meritorious rather than otherwise to waste water in the most extraordinary ways. A consumer who had left a tap running for months at full bore, for the supply of a duck pond, was summoned before the magistrates and got off with a small fine payable in instalments to suit his convenience. And a great deal of the discussion excited by the present distress appears to turn rather upon improving the position of the County Council as against the Companies, rather than seeking for a remedy in the interests of the consumer.

At this juncture Mr. Geo. Livesey, the Chairman of the South Metropolitan Gas Company, writes a letter to the *Times* comparing the position of the London water supply with the gas supply. In the last 50 years the price of London gas has been reduced one-half—from 6s. to less than 3s. per 1,000 cubic feet—but the water has remained about the same. The Gas Companies have amalgamated amongst themselves, reducing the number from 13 to 3. They have always had the prospect of competititon before them, and they have had the inducement of the sliding scale. But the Water Companies have had absolutely no fear of competition, and absolutely no inducement to reduce the price, whilst they are hampered by the contract system. Mr. Livesey's advice, put shortly, is that the Water Companies should follow the lead of the Gas Companies. That they should form themselves into two great undertakings—one for the North side, the other for the South side of the Thames. That they should adopt the meter system, including automatic meters for small houses, supplying at a fixed rate per 1,000 gallons, with the principle of the sliding scale. He does not see why the

same advantages should not follow that have been secured in the case of gas.

The great desideratum appears to be the spread of correct views on the subject of the use and of the waste of water. Mr. Livesey might have carried his comparison further, and pointed out that just by the use of improved gas burners, the consumer gets a much better value from the gas than he used to obtain 50 years ago. So the water user is still in the region of cockspurs and iron tips, and by looking after his taps and flushing apparatus may effect economies that cannot but rebound to his own benefit. Not only have the Companies no incentive to economy in working expenses, but the consumer goes further and does not object to wilful waste. Give the consumer the same incentive to economy that obtains in the case of gas, and the present resources of the water companies will be ample for many years to come. Of course the present state of things is made a plea for municipal ownership, but a careful and independent examination shows that the causes of the present troubles are not concerned with ownership at all.

A proper system of water supply, including the provision of storage cisterns that will hold a few hours supply of water at any rate, by the exercise of reasonable care and economy in the consumption of water, are questions that would not be affected in the slightest by a change of ownership.

The extent to which the automatic meter is being introduced, not only in London and our principal cities, but also in small towns and villages, is simply marvellous, and almost all of the reports of the half-year's working, that are issued by the directors of gas companies, include some notice of this new departure. The chairman of the Tottenham Gas Company has pointed out, that in the course of the 50 years that the undertaking has been in operation, they have supplied 5,764 consumers with meters of the ordinary pattern, but within the last three years they have fixed no less than 3,387 automatic meters. At Derby the slot meter was only taken on hand at the commencement of the present year, but 200 are already at work. The Crystal Palace District Gas Company have 4,200 in operation, of which over 1,000 have been fixed during the present year. In many other towns, 1,000 and upwards have been put in. Notwithstanding the drawback of the mild season, many concerns report an increased business, for which satisfactory state of affairs the slot meter is largely responsible. But, as I have already remarked, it must not be concluded that the prepayment meter is a kind of universal panacea, applicable to all gas concerns alike. Some are already finding that it is at best a qualified success. It is so costly that many gas companies cannot find the necessary capital, or would not act wisely in doing so. The present is certainly a good time for introducing it, as the low price of coal not only allows of full dividends being easily earned, but also leaves a little margin for experiments of this nature. It cannot be too often repeated that the success or otherwise of the scheme turns upon the rate of consumption per meter. The outlay means £5 or £6 per meter, and without questioning the desirability of introducing the automatic meter, it is open to question whether any competent gas works' manager, having authority to incur so much expenditure for the purpose of getting fresh business, could not lay it out to better advantage than in the purchase of the slot meters. Cooking stoves and gas engines appear to be rapidly attaining the position of main columns in the support of the gas business. Either a first-class stove, or a small gas engine, would not cost more than the outlay per meter on the prepayment system, and therefore, without questioning the judgment of the responsible parties in the examples above instanced, I think there are places where it would be more promising to direct enterprise in extending the use of gas in other directions. The automatic meter has been considered of sufficient importance to receive special attention in the address of Major Clayton, the President of the National Association of Colliery Managers, delivered at the annual meeting of that body. Only a little time back the chairman of a railway company alluded to the effect of gas stoves in reducing the quantity of coal carried. Major Clayton was laboring to account for the present state of the coal industry, and he blamed the mistaken policy of the Miners' Federation. One effect of the last strike was to send a large proportion of the trade to other districts, and a lot of it had never come back. Since the coal owners claim to be losing money at present prices, an outsider would take this as a negative blessing. But no one likes to lose trade, even if not profitable at the moment. The old story of the Irishman who sold goods at less than cost price, and trusted to the quantity for profit, appears to be not without illustration in actual practice. Major Clayton's figures are very instructive. With an approximate increased annual production throughout the country of nearly 1½ million tons, the districts covered by the Federation which caused the great strike of 1894, show a *decrease* of over one million tons. The trade of the non-federated districts has gone up about 2¾ millions, while the federated district has lost ground. To put this in its practical effect as regards the miner, we may ask whether he is better off, working three days per week at say 10s. per day, than when he works for four days per week at 9s. All this, however, by the way, Major Clayton goes on to say that another reason for slack trade is the enterprising action of the gas companies in erecting gas stoves free of cost, and he regards this as one of the the most serious points that the coal trade has to fear. In commenting on the remarks of the railway chairman, it was pointed out that his logic was somewhat defective, and as much may be said on the present occasion. It is a great deal too much to assume that in every case a gas stove has displaced a coal fire. Especially in crowded localities, people resorted to all sorts of expedients to avoid the trouble of lighting a fire. In many cases the gas stove is hailed as enabling cooking or warming to be done where it was impracticable before. It would be equally reasonable to say that the petroleum trade has been effected owing to the displacement of oil stoves.

American stoves are very largely used in artizans' houses, consuming coke or breeze. Oil, coke, etc., have to bear the competition of gas stoves without any compensating influence, but the colliery owner has the satisfaction of knowing that the bulk of the gas sold in this country is made from English coal, and therefore that if less house coal is required the gas company must buy more. I should take it that Major Clayton is looking at the position from the view of a vendor of house coals only, but even then it seems a very exaggerated view of the case to regard the gas stove as a serious antagonist to coal. If Major Clayton was to take the actual increase of gas sold as shown by the annual Parliamentary returns, calculate a fair comparative heating value for gas and the same for coal, and figure out the gas in tons of coal, he would find that the figures, large as they would be, formed a very insignificant proportion as compared with the total tonnage of coal. The matter is also interesting as illustrating the nervous unrest of the present age. Our forefathers enjoyed a rugged faith in themselves and their surroundings that was, if mistaken, nevertheless beneficial both mentally and physically, as saving them from needless worry. But it is impossible to take up a newspaper at the present day without finding paragraph after paragraph devoted to the study of "some of the most serious points we have to fear."

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. CHARLES J. LUTHER, formerly Superintendent of the Long Branch Lighting Company, which concern now forms part of the Consolidated Gas Company, of New Jersey, has been appointed Superintendent of the Rome (N. Y.) Gas and Electric Light Company.

WE are indebted to Mr. Henry L. Doherty, General Manager of the Madison (Wis.) Gas and Electric Company, for a series of handsome photographs illustrating the ways and means under which the Company carried on its "Summer Cooking School" during the season just closed—the "term" ended in the second week of September. Mr. Doherty's letter, informing us of his forwarding the cuts, gives a pretty clear idea of the success that attended the scholastic experiment. He says: "We are sending you under separate cover photographs of three classes of the summer cooking school which closed here last week. The Gas Company employed Miss Simpson for the week ending June 13th, and sufficient enthusiasm was worked up among the ladies to form a housekeepers' league, whose first work was the inauguration of this summer cooking school in conjunction with our Company. There was one demonstration class and three practice classes. The practice classes were necessarily small, to enable the instructor to give some attention to each pupil, but the demonstration class was only limited by the size of the room and the number who wanted to come. The daily average attendance was, approximately, 200 ladies. From these photographs you can easily see that it proved very successful. We are still selling gas cookers, although the season is getting late."

THE Woonsocket (R. I.) Gas Company is reported to have shut down its electric lighting annex.

AT the annual meeting of the Worcester (Mass.) Gas Light Company the reports of the officers for the year showed that the Company was in a prosperous condition. A quarterly dividend of 2 per cent. was declared, and the following officers were elected: Directors, C. D. Lamson, Albert Wood, Samuel B. Woodward, F. H. Dewey, A. G. Bul-

lock, J. H. Clarke; President, C. D. Lamson; Clerk and Treasurer, James P. Hamilton.

THE following notice issued by Mr. S. A. Foley, of Lincoln, Ills., explains itself: "Public notice is hereby given that F. M. Mills, owner of the gas plant in the city of Lincoln, has this day surrendered to me the full possession thereof, with all its assets, and that now I hold the same as mortgagee in possession. I have appointed the Hon. D. Turnbolt as my Superintendent, who is authorized to receive and to receipt for all money due. I wish to give my personal assurance that the business will receive my best attention."

MR. BENJAMIN THACKARA, the founder of the Thackara Manufacturing Company, of Philadelphia, which concern has for a long time been prominent in the gas fixture trade, died at his home in Philadelphia on the morning of the 15th inst. He was born at Haddonfield, N. J., June 4th, 1820, and after beginning his business life as a teacher, and subsequently engaging in the dry goods trade, he joined in the formation of the gas fixture manufacturing concern originally known as Cornelius & Baker, of Philadelphia. When they went out of business he joined the house of Miskey, Merrill & Thackara, which in turn was succeeded by Thackara, Buck & Co., and Thackara, Sons & Co., and which now is known as the Thackara Manufacturing Company. His wife (nee Miss Mary A. Enyard), to whom he was married in 1842, survives him, as do their three children.

THE betterments on the plant of the Oneida (N. Y.) Gas Company will be completed by December 1st. The work underway is hardly described in the term "betterments;" reconstruction would be nearer to the mark.

A RECENT issue of the Boston *Advertiser* says that the forthcoming annual meeting of the Brookline Gas Company, to be held the latter part of this month, will be of unusual interest to the investment public of this vicinity since it is most probable that at that meeting certain changes will take place in the directorate and the working agreement entered into with the Bay State Gas Company, under the guidance of Mr. Whitney, will be demonstrated for the benefit of the stockholders not at present cognizant of the inside workings of said agreement."

THE following dividends were disbursed during August on gas shares largely held in San Francisco:

Company.	Rate per Share.	Amount.
Central Gas Light	$1.00	$20,000
Oakland Gas	.25	7,500
Pacific Gas Improvement	.50	15,000
Pacific Lighting	.35	7,000
San Francisco Gas Light	.35	35,000

THE *American Exchange and Review*, in speculating as to the "Ignitive Hazards of Electricity and Illuminating Gas," remarks, that the proportion of the buildings of the United States exposed to ignitive electric hazard is not known, even approximately, though it is known that the electric ignitions are less than 1 per cent. of the whole, and electricity is now causing about 1.3 per cent. of the fire loss of the country—that is, apart from its share in the unknown causes of fire. Should 2 per cent. of the buildings have electric exposure, electricity would be below the average of ignitives in destructive fire kindling. In present conditions it can be said that electricity makes less fires, but burns more, than carbureted hydrogen gas, whose jets started 462 fires in the United States in 1895, according to the Chronicle Fire Tables, while 249 was the number of electric wire and light fires. In the ratio, $\frac{249}{462}$, there will be a greater proportionate increase annually in the numerator than the denominator, as electricity is the more advancing agency. If it be no exaggeration to say that buildings affected by the gas plant are at least ten times as numerous as the buildings affected by the electric plant, then the electricity would have about five times the ignitive force of the carbureted hydrogen.

THE prepayment meter system steadily gains favor in Lewes, England; at least the following figures from the half-yearly reports of the Company for the periods indicated, would seem to so prove:

Period.	Output, Prepayment Meters.
Half-year ended Dec., 1894	21,800 cubic feet.
" " June, 1895	134,300 "
" " Dec., 1895	478,200 "
" " June, 1896	623,000 "

The success of the prepayment meter in Lewes is instanced to show that prepayment meters, in England at any rate, are to have a permanent part in the development of the gas business of comparatively small places. The Lewes Company caters to a population of something less than 12,500. In 1895 it supplied gas to 850 separate meters, and to 235 public lamps, and the total quantity of gas sold amounted to 39,250,000 cubic feet. The price charged to ordinary consumers was 95 cents per 1,000, and the supply to the public lamps was charged for at the rate of 87 cents per 1,000.

THE proprietors of the Akron (Ohio) Gas Company, according to a local source, expended $150,000 this year in plant enlargement and main extensions. Water gas sets, up to producing 400,000 cubic feet per day, have been installed; new purifiers up to passing 600,000 cubic feet per day, have been constructed, also, a new gasholder, with a capacity of 350,000 cubic feet—this gives the Company storage facilities for 510,000 cubic feet. The main system was increased to 45 miles, and the Company is in excellent shape to meet any demand that may be made upon its resources.

ADVICES from Topeka, Kansas, are to the effect that Messrs. A. M. Caffman and Frank D. Biedler, of Baltimore, Md.; J. A. Bendure, of Atchison, Kansas, and Wm. Addis, D. W. Hainer, H. Parkman and J. O. Patterson, of Emporia, Kansas, have proclaimed themselves incorporators of the Emporia Electric Light, Railway and Gas Company. The concern is capitalized in $100,000, and is more than likely intended to operate the gas and electric lighting interests for joint account.

MR. FORREST E. BARKER, Chairman of the Massachusetts Board of Gas and Electric Light Commissioners, is home again, after a trip to Europe that took up something over seven weeks. During his sojourn abroad he saw many things of interest in connection with the artificial lighting industry, and it is hoped that he can be prevailed upon, at the St. Louis meeting of the American Association, to say something about his experience this summer amongst the gas makers of Europe. Nor can there be any doubt, that what he would say would be worth listening to; for the Commissioner is not only an observant man, but a man who can put in terse form an understandable story of his observations.

AT the annual meeting of the Lewiston (Me.) Gas Light Company, the shareholders named the following officers: Directors, Wallace H. White, Seth M. Carter, Edward C. Lee, Samuel T. Bodine and Randal Morgan; Clerk, William R. Stevens; Treasurer, Edward C. Lee.

THE Louisville (Ky.) *Commercial* says that Mr. John M. Brown, law clerk to the Mayor of that city, is preparing suit against the Louisville Gas Company, for taxes which the city claims against the Company through a peculiar construction of the local statutes. The claims which go back to 1891, and are urged for each year since that date, amount to $113,260.29.

MR. S. W. VAN SYCKEL, whose purchase of the Petaluma (Cal.) Gas Light Company, has heretofore been noted in the JOURNAL, will rebuild the plant. He has also decided to retain Mr. Fred. A. Wickersham in the post of Secretary to the Company.

THE only bid submitted for the public lighting of Little Falls, N.Y., by means of arc electric lights, was that by the Little Falls Electric Light Company. The figure asked was 27 cents per lamp per night.

THE Pintsch gas plant at Camden (N. J.) for the manufacture of gas for the lighting of the railway coaches of the Philadelphia and Reading Railroad, has been completed.

WE regret to report the death of Major General James D. Morgan, whose demise occurred at his home in Quincy (Ills.) on the morning of the 12th inst. Deceased was born in Boston, Mass., August 1st, 1810, and settled in Quincy 24 years later. He was a veteran of the Mexican war when the rebellion broke out, and enlisted for service in that outbreak with the Tenth Regiment Illinois Volunteers, with the rank of Lieutenant Colonel. When the struggle was declared at an end he had attained the rank of division commander, under General Sherman. After the war he engaged in mercantile pursuits, and was for some time President of the Quincy Gas Light and Coke Company. At the time of his death he was President of the Army of the Cumberland, and Treasurer of the Soldiers' Home at Quincy.

THE New Albany (Ind.) Gas Light and Coke Company, through its attorney, Mr. Alexander Dowling, has brought suit in the Floyd Circuit Court against the City of New Albany, for $10,000, which sum is claimed to be due plaintiff for lighting the streets of New Albany with gas. The Company claims that the city violated its contract, in that,

on January 1st, 1892, the city cut out 84 lamps that lighted the central part of the city. The Company avers that it was at all times ready to comply with its contract to light the streets by means of the lamps thus shut off, but was prevented by the city. Plaintiff then goes on to say that under its contract with the city in 1870, and by virtue of an amendment made by mutual agreement between the parties by the City Council in 1888, it went to great expense in improving its plant, laying new mains and adding new machinery and buildings, in order that it might be fully prepared to discharge all its obligations to the city, and that as the city has prevented the Company from discharging its obligations under its contract, the city is, therefore, liable to the plaintiff in the sum of $10,000.

Last week we had occasion to note that the Richmond, Va., authorities had almost determined upon a plan of "retrenchment," in connection with the operation of the municipal gas works, one feature of the proposed economy being the sale of the horse and buggy which carried the worthy Superintendent to, from and between his changing posts of duty. This week we have an opportunity to show the reverse of the retrenchment practice, for a proposition is before the Council "to supply gas free to the educational department of Young Men's Christian Association." Of course, no one will find fault with such a charitable and praiseworthy donation, but it seems hardly fair to oblige the Superintendent to walk so that the students may read.

The proprietors of the electric lighting supply of Van Wert, O., are in trouble, the holders of a mortgage for $50,000 on the plant having commenced foreclosure proceedings.

The plant of the United Coke and Gas Company, at Glassport, Pa., the first mention of the proposed construction of which will be found in our item columns for July 20th, is about half completed. The projectors believe that everything will be in readiness by December 1st for a trial run.

The following interesting mention of the artificial lighting industry of Rochester, N. Y., is from the *Post-Express*, of that city: "The Rochester Gas and Electric Company was incorporated in 1892, with a capital stock of $4,300,000, being a consolidation of the Citizens Gas Company, the Rochester Gas Light Company, the Municipal Gas Light Company, the Edison Electric Illuminating Company, and the Rochester Electric Light Company. The present corporation has offices at 66 Mumford street, and J. Lee Judson is President; William Runkle, First Vice-President; Frederick Cook, Second Vice-President; George W. Archer, Treasurer; and W. L. Cole, Secretary. Adjoining the office on Mumford street are the yards for the storage of material, while the gas plant of the Company, located at 'Gas House Flats,' near Vincent place bridge, is completely equipped for the manufacture of gas from both coal and oil, and has a productive capacity of 3,500,000 cubic feet daily. There are two large gasholders, 150 miles of main pipe, and 16,000 meters are on circuit. The electric light station, No. 1, on Edison street, is equipped with eight engines and eight boilers, twelve incandescent dynamos and four arc dynamos; station No. 3, on Brown's race, has five water wheels, six 500-horse power engines, fourteen Thomson-Houston and one Brush arc dynamos, and fourteen Edison generators; station No. 4, at the foot of Water street, has three water wheels, one 500-horse power engine, six arc light dynamos, and six Edison generators. On the Company's circuits are 2,148 arc lights and 488 motors. The Brush Electric Company, although separately organized, is closely affiliated with the Rochester Gas and Electric Company, Mr. George W. Archer, who is Treasurer of the latter Company, being President of the Brush Electric Company, of which J. Lee Judson is Treasurer. This Company has a capital stock of $250,000, and its station at the Lower Falls has sixteen water wheels, a 600 horse power engine, two 180-horse power alternating dynamos, and three 500-volt dynamos. The two Companies have together 39,000 incandescent lights in circuit. The gas business of the Rochester Gas and Electric Company is very large, not only in the matter of a lighting supply, but also for cooking and heating purposes, the Company showing commendable enterprise in loaning to its patrons cooking stoves and ranges."

The following is from a correspondent at Montreal, Canada, under date of the 20th inst.: "The Peoples Heat and Light Company, of Halifax, N. S., which is controlled by Messrs. H. M. Whitney and other capitalists, is reported to have purchased the works and goodwill of the Halifax Gas Light Company. The price agreed upon is not stated, but it is believed to be something like $400,000. Some time ago the old Company asked $500,000 for its property and business, and the Peoples Heat and Light Company, it is said, offered $350,000. The negotiations which have since been in progress are believed to have culminated in the sale, though men interested decline to confirm the statement. The Peoples Company has been laying pipes through the city streets since spring opened, but orders were issued last night to discontinue the work."

The Fire Loss in 1895.

To most persons the subject of fire losses is interesting, even if it does not appeal to them personally. For 21 years the *Chronicle*, the principal organ of the insurance interest in New York, has published tables setting forth the annual fire loss in the United States, and this year these tables, comparing similar losses in earlier years with those of last year in all parts of the country, are more interesting and illuminative than ever before.

In considering the loss by fire, insurance men look at the subject from two points. The property loss is one thing to them, the insurance loss is another. The first is the total loss; the second, the loss that falls upon the insurance companies. In brief, there were 38,003 fires in 1895, which destroyed 53,961 pieces of property; the total loss amounted to $142,110,233, and the insurance loss to $84,698,030. These amounts are enormous in themselves, but it is to be recorded that the average property loss and the average insurance loss were smaller than ever before, being $3,793 for the former and $2,228 for the latter, as against $3,938 and $2,530 respectively in 1894. That is, in 1895 the insurance covered 64 per cent. of the loss, while in 1894 it covered less than 60 per cent.

In 1895 there were 22,711 fires in dwelling houses; next in number were the fires in stores and offices, which amounted to 12,543; livery stables, barns and tobacco barns (a rather strange combination) came third, with 8,142 fires; 302 colleges, schoolhouses and convents were burned, 503 theaters and public and private halls, and 340 churches. Manufacturing establishments to the number of 5,231, and hotels, clubs and restaurants to that of 1,332, were injured more or less seriously by fire. Of the 53,961 pieces of property injured, 15,953 caught fire from exposure to fires originating elsewhere, and the loss caused by these 16,000 fires amounted to nearly $38,000,000—equal to more than 26 per cent. of the total loss.

Naturally, the summer months show the lightest losses. May was the month of lightest property loss and June that of lightest insurance loss. The greatest insurance loss and the greatest number of fires occurred in October, seemingly because the furnace fires began to be lighted in that month. The greatest property loss, however, occurred in March; in that month occurred seven fires involving losses of more than $200,000 each, while three of them caused losses of more than $400,000 each.

The Western States provided a larger percentage of the fires than ever before, with 40.7 per cent. to their account; the Middle States had 26.5 per cent. The fires in these two sections were more numerous than in 1894, but in the Eastern, the Southern and the Pacific States the per centage decreased.

A table of especial interest is that showing the fires caused by electric wires or lights. Naturally, the question of electricity as a cause of fire did not come up very long ago; in fact, it is only for the ten years 1886–1895 that figures on the matter are to be had. In 1895 there were 249 fires caused by electricity, as against 217 in 1894; but the fires caused by exposure to those started by electricity numbered only 89, instead of 169 in the former year. So the total number of fires caused by electricity was 338 in 1895 and 386 in 1894, a very marked falling off. It is evident that greater care in insulating wires and in other matters connected with electrical plants is taken.

A table of the losses by their causes occupies a considerable part of the *Chronicle's* book, and affords much of interest and instruction. Accidents caused 298 fires, 29 of them in the District of Columbia and 27 in New York State. Hot ashes and coals started 318 fires, and bonfires only 49, while burglars caused 65. Candles set 248 fires, and carelessness only 203, while children playing with fire were responsible for 71. Fires to the number of 536 were due to cigars, cigarettes and tobacco pipes, while 3,607 were caused by defective flues. Of these, 358 were in Illinois and 331 in this State. Drunken men set 16 fires in 13 States. Explosions caused 3,051 fires; of these 6 were dust explosions, occurring in Illinois, Iowa and Wisconsin. Fireworks and firecrackers caused 319 fires; incendiarism, 3,521; lightning, 839, and matches, 1,771. Mischievous children started 21 fires and natural gas 81, two of which were in New York State. The much maligned plumber caused only 61 fires with his furnace, while locomotive sparks set 427. Spontaneous

(*Continued on page* 495.)

THE AMERICAN GAS LIGHT JOURNAL

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MONDAY, SEPT. 28, 1896.

(*Continued from page* 494.)

combustion is held responsible for 521 fires, stoves for 1,546, and tramps for 268. Of unknown and unassignable origin were 5,981 fires, while 8,361 were not reported as insurance losses. A study of the cause tables enables the *Chronicle* to say that the inherent and common causes show each an increased percentage, while the indirect (of criminal and mischievous origin) and the unknown and unreported show each a decreased percentage.

In the 21 years covered by the tables 25 gymnasiums have been burned, 138 armories, 13 chambers of commerce and boards of trade, and 3,144 churches. In 14 years 59,570 barns and stables were burned, and 170,949 dwellings.

Fifty seven grand stands have gone up in smoke; 73 artificial ice factories, 2,150 ice houses, and 51 refrigerator factories have succumbed in 21 years, and so have 941 theaters and opera houses. In four years 16 tin plate factories have been burned. On the other hand, the business failures and the fires do not maintain an even ratio, in spite of the humorists of the weekly papers; in 1895 there were 13,013 failures and 38,003 fires, while in 1894 the figures were 12,724 and 35,549; and in 1893, 15,508 and 35,188 respectively.

Not only did October, 1895, lead the months in the number of its fires, but it has led them in the matter for 20 years. During that time 33,995 fires started in October; December comes next with 33,806 fires.

During the past 20 years New York suffered a property loss of $320,003,720; Pennsylvania, one of $173,086,623; Illinois, one of $125,735,034; and Massachusetts, one of $125,246,015. Ohio will be glad to be fifth in losses, with $121,180,936 damage.

The average loss at a fire was less in 1895 than ever before, but this was due to the absence of any very great fire; the actual number of fires was greater by 1,695 than that of 1894. The total loss during the 21 years considered in the tables amounts to $2,219,500,491. This is absolutely and entirely lost, an average of more than $100,000,000 a year. Such a loss demands serious practical consideration, but, says the *Chronicle*, "there does not seem to be very much hope of any material reduction, but rather of a gradual increase in the fire waste. The people would rather lose their property than to take effectual steps to preserve it."

Smoke Prevention.

Prof. C. H. Benjamin, in discussing, in the *Mechanical World*, the matter of how to prevent the formation of smoke in the operating of steam plants, remarks:

"I will mention what seems to me to be the requirements of a good smoke preventing device. In the first place, variable feed. It is necessary that it should be possible to vary the feed of the stoker quickly and conveniently. In the second place, it is necessary that the facing of the grate bars should be variable; that the air spaces between the bars may be varied, and the coarseness or fineness of the grate may be quickly adapted to the particular kind of coal used. Third, it is necessary that the grate bars should be of the automatic shaking type, so as to prevent the formation of clinkers and facilitate the dropping of the ash. Some form of air control is quite important. Almost any form of stoker or grate under hard service needs a high chimney. The great difficulty in many of our establishments is that the chimney is not high enough and the draught not powerful enough. There should be a margin, and the fireman should have the means of controlling it. If there is not enough draught the fireman cannot do anything; if there is too much he can easily reduce it. It is impossible to get good results with a small grate. A grate which is large enough under ordinary conditions is not large enough under sudden emergencies. In order that a stoker may commend itself to a purchaser, it should be easily acces sible for cleaning and repairing, and it should be so located that it can be taken out and replaced without tearing out the whole front of the boiler. This is one of the serious objections to several forms of stokers which otherwise are very desirable. Among the requirements in smoke prevention no item is of such importance as good firing. A good fireman can, with an ordinary grate, give good economy, and to a large extent prevent the formation of smoke, if the boiler is not forced beyond its capacity. A good fireman is just as necessary with any form of stoker that has ever been used. The reason why so many chimneys smoke is partly because there is not enough fireman, and also because there is not enough boiler.

"It has been claimed by opponents to mechanical stokers, or to any form of surface which is intended to prevent the formation of smoke, that it is impossible to realize the full duty of a boiler when equipped with such a device. I know from my own experience that that is not true. I have made experiments with one form of stoker, and continued them for several years. I found it entirely feasible to double the rated capacity of the ordinary return tubular boiler without the formation of smoke. Of course, when the fire is being cleaned, there is a little smoke. But during the ordinary combustion there is no smoke except the blue smoke which is due to impurities. It is possible to double the ordinary rating of the boiler without smoke, with an ordinary mechanical stoker, and to expect more than this is unreasonable. With hand firing you cannot go beyond this without making smoke and without limiting the life of the boiler. It has been found by repeated experiments that such attempts are made at the expense of the boiler.

"Summing up, then, I will say the principal requirements for the prevention of smoke are the adoption of a device which shall best be adapted to the particular situation; second, a chimney of suitable size and height; third, a boiler which is at least half as big as it ought to be; and last, but not least, a capable fireman."

The Market for Gas Securities.

The net result for the week in the market for city gas shares is a fair gain in values, although Equitable and East River common are the exceptions to the rule, the former being reported at 195 to 200, with 31½ to 33½ on offer for the latter. Consolidated, the volume of business in which was exceptionally small, is reported to-day (Friday) at 145½ to 147. From our point of view Consolidated is likely to score a decided advance in the near future. Standard common, on fair inquiry, climbed to 79 bid, holders asking 80½ for it; 100 Brooklyn Union Gas sold yesterday at 90, the closing quotations being 89 to 93. We repeat our belief that this stock is very cheap at the market.

Chicago gas opened to-day at 61⅞ to 62½, and gave every evidence of strength. Baltimore Consolidated is 60½ bid, and Lacledes are strong, especially the common, which is 24½ bid. The United Gas Improvement Company has declared its regular quarterly dividend of 2 per cent., payable October 15th, to stockholders of record September 30th. The Bay State issues are neglected, but at the ruling prices we think they are cheap. This remark particularly applies to the bonds known as the Boston United, first series, sinking fund trust. The demand for all classes of gas bonds in solvent Companies is still active.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

SEPT. 28.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,430,000	100	145½	147
Central	500,000	50	150	..
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	195	200
Bonds, 6's	1,000,000	1,000	105	.
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	210	..
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	
Northern	150,000	50	79	80½
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	31½	33½
Preferred	2,000,000	100	..	65
Bonds 1st 5's	3,500,000	1,000	96	98
" 1st Con. 5's	1,500,000	.	86	88
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	.	
Standard	5,000,000	100	79	80½
Preferred	5,000,000	100	103	106
Bonds, 1st Mortgage, 5's	1,500,000	1,000	107	111
Yonkers	299,650	50	130	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	87	90
" " Bonds (5's)	15,000,000	1,000	104	105
Bay State	5,000,000	50	14½	16½
" Income Bonds	2,000,000	1,000	27	30
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	76	73
2d " " "	3,000,000	1,000	60	65
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Co.	25,000,000	100	61⅞	62¼
Chicago Gas Lt. & Coke Co.				
Guaranteed Gold Bonds	7,650,000	1,000	94	94¼
Columbus	1,000,000	..	..	65
1st Mortgage	1,085,000	..	..	95
Consumers, Jersey City	2,000,000	100	60	75
" Bonds	600,000	1,000	97	101
Cincinnati G. & C. Co.	7,000,000	100	195	..
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	41
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	1,000,000	100	60½	..
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..

Detroit	4,000,000	..	32	33
" Con. Bonds	4,312,000	..	..	82
Equitable Gas & Fuel Co., Chicago, Bonds	2,000.000	1,000	..	101
Fort Wayne	2,000,000	..	78	88
" Bonds	2,000,000	..	85	90
Hartford	750,000	25	..	14
Indianapolis	2,000,000	..	115	130
" Bonds, 6's	2,650,000	..	99½	101½
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind	1,000,000	100	..	90
Bonds	1,000,000	1,000	85	90
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	24½	25
Preferred	2,500,000	100	.	80
Bonds	9,034,400	1,000	88	90
Little Falls, N. Y	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co	1,000,000	..	93	98
Bonds, 6's	4,000,000	..	123	..
New Haven	1,000,000	25	225	..
Oakland, Cal	2,000,000	..	52	53¼
" Bonds	750,000	..	..	..
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	2,100,000	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Paterson, N. J	.....	25	99	102
Rochester Gas & Elec. Co	2,150,000	50	..	..
Preferred	2,150,000	50	88	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal	10.000,000	100	86½	87
St. Paul Gas Light Co	1,500,000	100	67½	70
1st Mortgage, 6's	650,000	..	84	87
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	.	88	90
Syracuse, N. Y.	500.000	25	..	..
Washington, D. C	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	53	58
Bonds, 5's	3,556,000	.	80	85
Wilmington, Del	500.000	50	180	182

Advertisers' Index.

GAS ENGINEERS.

Page

Jos. R. Thomas, New York City ... 517
Wm. Henry White, New York City ... 515
Fred. Bredel, Milwaukee, Wis ... 500
Geo. R. Rowland, New York City ... 515
The Western Gas Construction Co., Fort Wayne, Ind ... 506
Humphreys & Glasgow, New York City ... 502
T. G. Lansden, St. Louis, Mo ... 515
American Gas Co., Phila., Pa ... 500
David Leavitt Hough, New York City ... 517

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md ... 513
United Gas Improvement Co., Phila., Pa ... 505
Burdett Loomis, Hartford, Conn ... 504
National Gas and Water Co., Chicago, Ills ... 517
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 513
The Western Gas Construction Co., Fort Wayne, Ind ... 506

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd & Sons, New York City ... 516
Continental Iron Works, Brooklyn, N. Y ... 514
Deily & Fowler, Phila., Pa ... 516
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 512
Stacey Mfg. Co., Cincinnati, Ohio ... 515
Bartlett, Hayward & Co., Baltimore, Md ... 513
Davis and Farnum Mfg. Co., Waltham, Mass ... 512
R. D. Wood & Co., Phila., Pa ... 514
Isbell-Porter Company, New York City ... 514
Fred. Bredel, Milwaukee, Wis ... 500
United Gas Improvement Co., Phila., Pa ... 505
Berlin Iron Bridge Co., East Berlin, Conn ... 502
National Gas and Water Co., Chicago, Ills ... 507
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 513
The Western Gas Construction Co., Fort Wayne, Ind ... 506
Humphreys & Glasgow, New York City ... 502
Gas Engineering Co., Pittsburgh, Pa ... 512
American Gas Co., Phila., Pa ... 500

SCRUBBERS AND CONDENSERS.

G. Shepard Page's Sons, New York City ... 515
R. D. Wood & Co., Phila., Pa ... 514
James R. Floyd & Sons, New York City ... 516
Continental Iron Works, Brooklyn, N. Y ... 514
Gas Engineering Co., Pittsburgh, Pa ... 512

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md ... 513
Fred. Bredel, Milwaukee, Wis ... 500
J. H. Gautier & Co., Jersey City, N. J ... 510
Parker-Russell Mining and Mfg. Co., St. Louis, Mo ... 510
Adam Weber New York City ... 510

TAR AND CARBONIC ACID EXTRACTOR.

G. Shepard Page's Sons, New York City ... 515

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich ... 497
G. Shepard Page's Sons, New York City ... 515
Gas Engineering Co., Pittsburgh, Pa ... 512

GAS METERS.

John J. Griffin & Co., Phila., Pa ... 480
American Meter Co., New York and Philadelphia ... 519
The Goodwin Meter Co., Phila., Pa ... 518
Helme & McIlhenny, Phila., Pa ... 519
D. McDonald & Co., Albany, N.Y ... 519
Nathaniel Tufts, Boston, Mass ... 518
Maryland Meter and Mfg. Co. Baltimore, Md ... 518
Metric Metal Co., Erie, Pa ... 518
Keystone Meter Co., Royersford, Pa ... 498
Buhl Stamping Company, Detroit, Mich ... 519

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia ... 519
John J. Griffin & Co., Phila., Pa ... 480
D. McDonald & Co., Albany, N. Y ... 519
Helme & McIlhenny, Phila., Pa ... 519

GAS AND WATER PIPES.

Ohio Pipe Co., Columbus, Ohio ... 517
M. J. Drummond, New York City ... 517
R. D. Wood & Co., Phila., Pa ... 514
Warren Foundry and Machine Co., New York City ... 517
Donaldson Iron Co., Emaus, Pa ... 517
Addyston Pipe and Steel Co., Cincinnati, O ... 517

PIPE CUTTERS.

Wm. Anderson, East Boston, Mass ... 497

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, New York City ... 517

GAS COALS.

Penn Gas Coal Co., Phila., Pa ... 509
Perkins & Co., New York City ... 508
Despard Gas Coal Co., Baltimore, Md ... 509
Westmoreland Coal Co., Phila., Pa ... 509
Berwind-White Coal Mining Co., New York and Phila ... 508

CANNEL COALS.

Perkins & Co., New York City ... 508

GAS ENRICHERS.

Standard Oil Co., New York City ... 509
The Sun Oil Co., Pittsburgh, Pa ... 509

COKE CRUSHER.

C. M. Keller, Columbus, Ind ... 509

CONVEYING MACHINERY.

C. W. Hunt Company, N. Y. City ... 498

GAS GAUGES.

The Bristol Co., Waterbury, Conn ... 497

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City. 507
Isbell-Porter Co., New York City ... 514
The Wilder Mfg. Co. Phila., Pa ... 498

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Company, New York City ... 514
Continental Iron Works, Brooklyn, N. Y ... 514
G. Shepard Page's Sons, New York City ... 515

RETORTS AND FIREBRICK.

J. H. Gautier & Co., Jersey City, N. J ... 510
B. Kreischer & Sons, New York City ... 510
Adam Weber, New York City ... 510
Laclede Firebrick Mfg. Co., St. Louis, Mo ... 510
Cyrus Borgner, Phila., Pa ... 510
James Gardner, Jr., Pittsburgh, Pa ... 510
Henry Maurer & Son, New York City ... 510
Baltimore Retort and Firebrick Co., Baltimore, Md ... 510
Parker-Russell Mining and Mfg. Co., St. Louis, Mo ... 510
Brooklyn Firebrick Works, Brooklyn, N. Y ... 510

CEMENTS.

C. L. Gerould & Co., Mount Vernon, N. Y ... 510

INCANDESCENT GAS LAMPS.

Welsbach Commercial Co., Phila., Pa ... 499

MICA GOODS.

The Mica Mfg. Co., New York City ... 497

BURNERS.

C. A. Gefrorer, Phila., Pa ... 514

LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn ... 497

GAS TUBING.

Wm. M. Crane & Co., New York City ... 501

PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City 507
Greenpoint Chemical Works, Brooklyn, N. Y ... 507
Henry W. Douglas, Ann Arbor, Mich ... 507

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind ... 504
Isbell-Porter Company, New York City ... 514
Connelly Iron Sponge and Governor Co., New York City 507

VALVES.

Tudlow Valve Manufacturing Co., Troy, N.Y ... 506
Chapman Valve Manufacturing Co., Boston, Mass ... 506
R. D. Wood & Co., Phila., Pa ... 514
Continental Iron Works, Brooklyn, N. Y ... 514
The P. H. & F. M. Roots Co., Connersville, Ind ... 504
Isbell-Porter Co., New York City ... 514
The Western Gas Construction Co., Fort Wayne, Ind ... 506

ELECTRICAL APPARATUS.

Wm. Henry White, New York City ... 515

GAS ENGINES.

Otto Gas Engine Works, Phila., Pa ... 520
The American Gas Engine Co., Phila., Pa ... 511
Backus Water Motor Co., Newark, N. J ... 497

ENGINES AND BOILERS.

The Hazelton Boiler Company, New York City ... 497
W. G. & G. Greenfield, East Newark, N. J ... 497

PURIFIER SCREENS.

John Cabot, New York City ... 497

GAS STOVES.

American Meter Co., New York and Philadelphia ... 503
The Goodwin Meter Co., Phila., Pa ... 518
George M. Clark & Co., Chicago, Ills ... 501
Maryland Meter and Manufacturing Co., Baltimore, Md. 518
William M. Crane & Co., New York City ... 501
Keystone Meter Co., Royersford, Pa ... 498
A. Weiskittel & Son, Baltimore, Md ... 61

CHINA GAS KILNS.

William M. Crane & Co., New York City ... 501

GASHOLDER PAINT.

New York Marine Paint Co., Poughkeepsie, N.Y ... 506

GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N. Y ... 506

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md ... 513
Continental Iron Works, Brooklyn, N. Y ... 514
Deily & Fowler, Philadelphia, Pa ... 516
Davis & Farnum Mfg. Co., Waltham, Mass ... 512
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 512
Stacey Mfg. Co., Cincinnati, Ohio ... 515
R. D. Wood & Co., Philadelphia, Pa ... 514

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
DREXEL BUILDING, PHILA., Sept. 24, 1896.

The Directors have declared a quarterly dividend of 2 per cent. ($1 per share), payable on Oct. 15, 1896, to stockholders of record at the close of business Sept. 30. Checks will be mailed.

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As Superintendent of Small Gas Works

By a practical coal gas man. Is master of all details about the works, and in the laying of mains and services, gasfitting and general repairs. Best of references. Address

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WANTED,

By a young man of several years' experience in all branches of the business—construction, manufacturing, mechanical and clerical—a position to take full charge of works as Supt. of manufacturing and distribution. At present in charge of works sending out 15,000,000 feet annually; 25 per cent. increase in business of same for year 1895 accomplished by the sale of stoves and Welsbach lights. A position where increase of business, improvement of property, economical management and good service will be appreciated. Has had 20 years' experience, and not afraid of work. Coal gas works preferred. Gas companies and well-known gas engineers as references. Salary reasonable. Address

1109-4 "T. V. P.," care this Journal.

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by a capable, energetic and economical manager. Over five years with present Company. Good reasons for desiring a change. Address

1102-tf "H. G. E.," care this Journal.

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By a man 34 years of age. Sixteen years' experience in the manufacture and distribution of Coal Gas as Supt., and four years in the Electric line. Thoroughly competent to take charge of any plant, separately or combined. A practical mechanic, and understands the erection of gas plants and everything pertaining to the business. Not afraid of work. Salary no object until ability is proven. Best of references.

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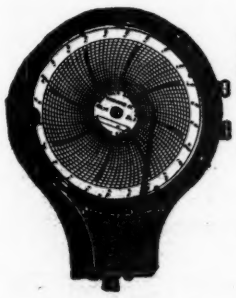

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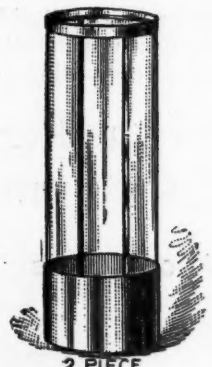

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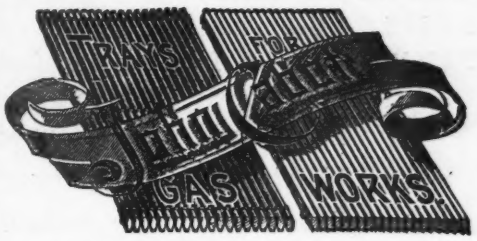

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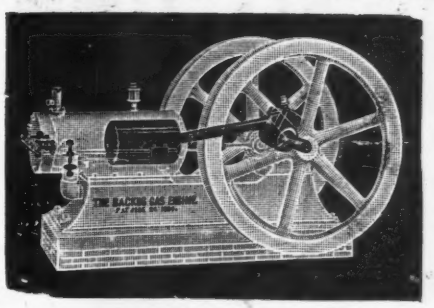

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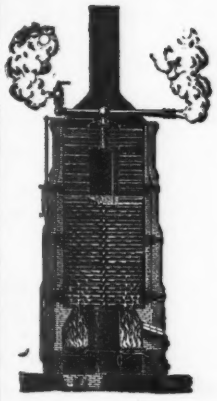

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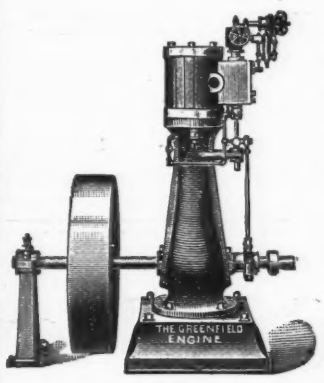

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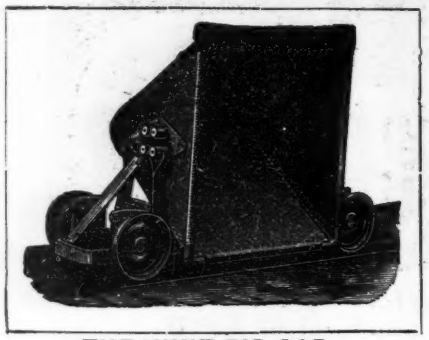

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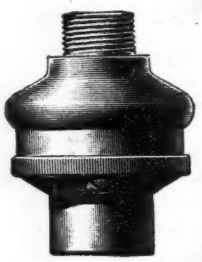

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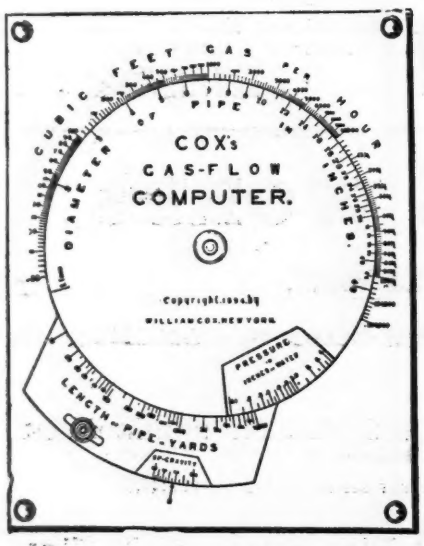

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Persons dealing in counterfeit lights are liable to criminal prosecution, and a large number of indictments have already been found against such dealers.

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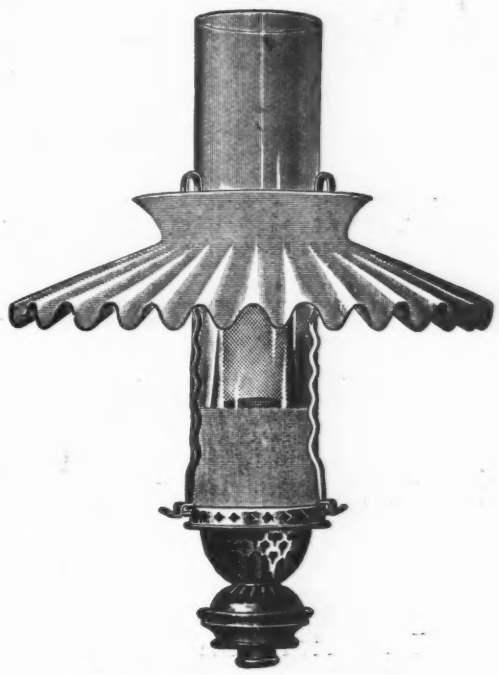
This notice is given in view of an effort now being made to introduce into this country infringing lights made in Germany, the sale of which, there, has been prohibited by the recent decision of the German Patent Office sustaining the validity of the Welsbach patents.

For your own protection, see that you get the genuine Welsbach light, as both the counterfeit and the infringing lights are greatly inferior.



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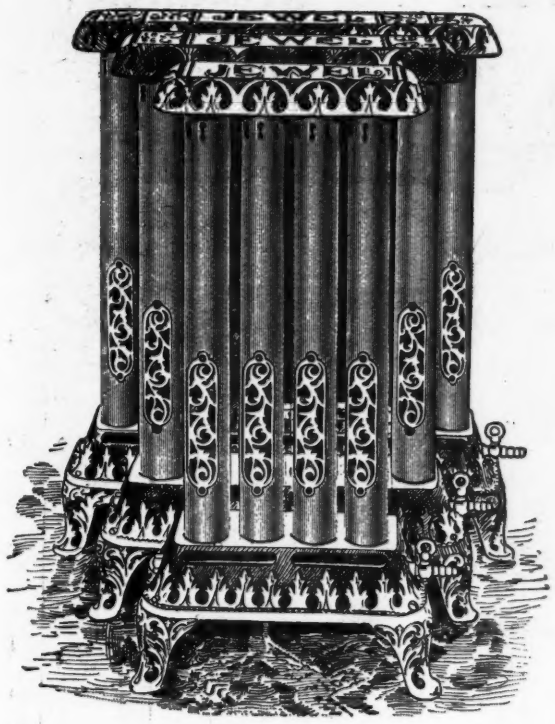

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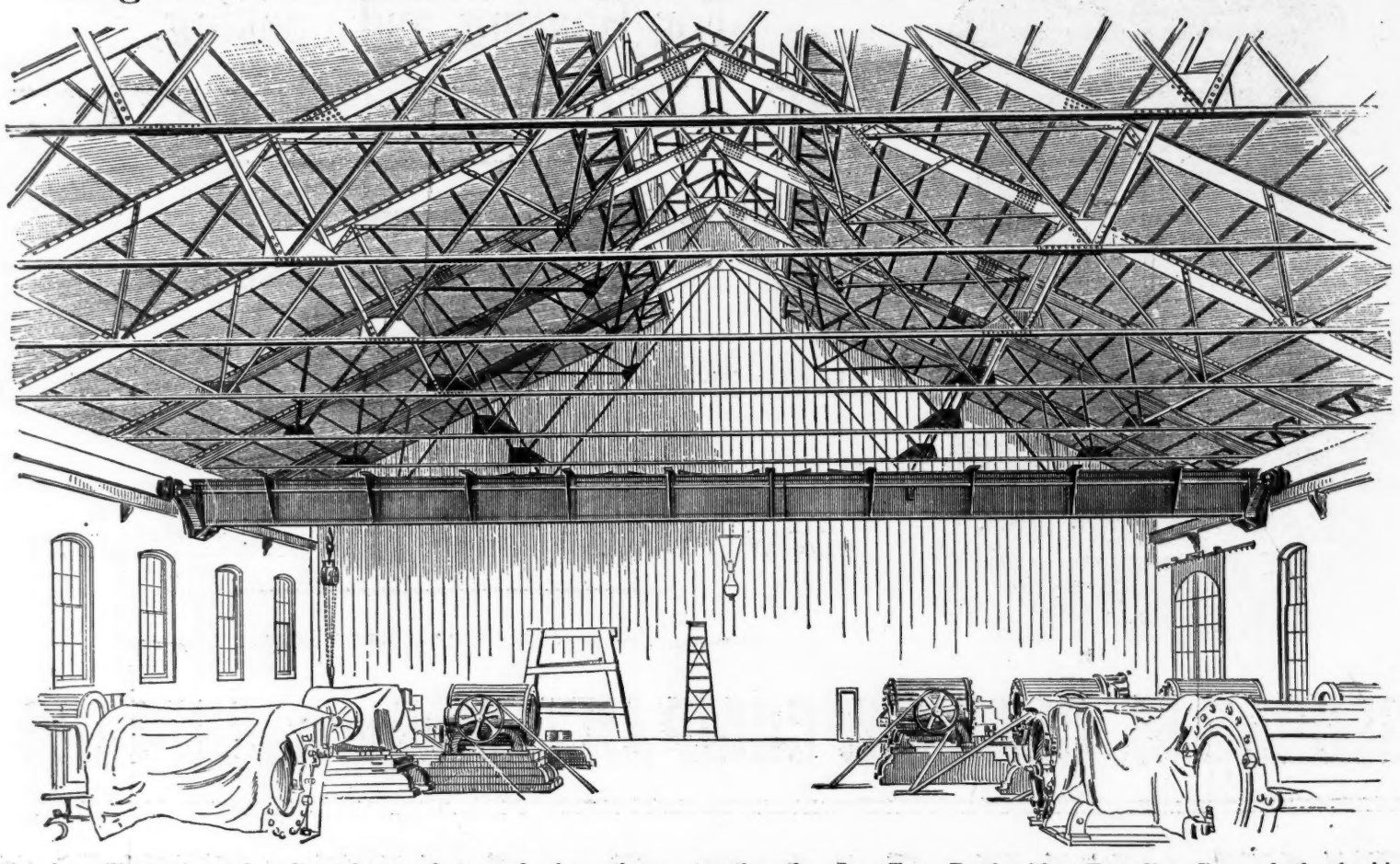

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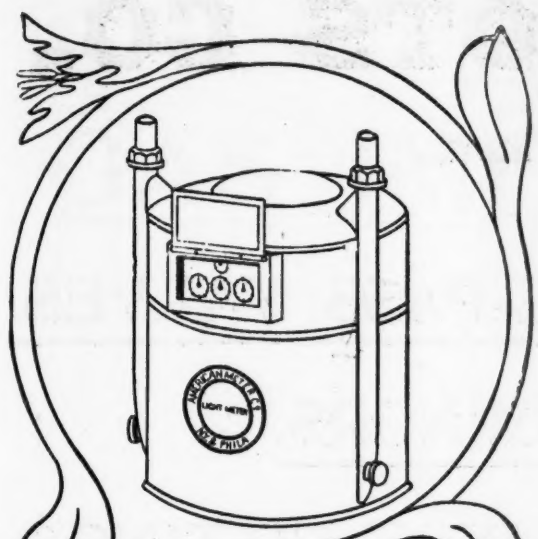

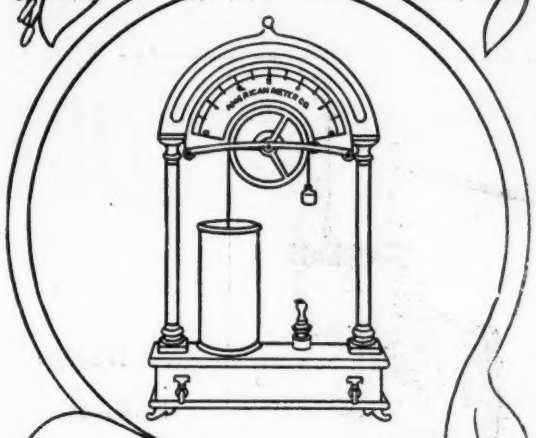

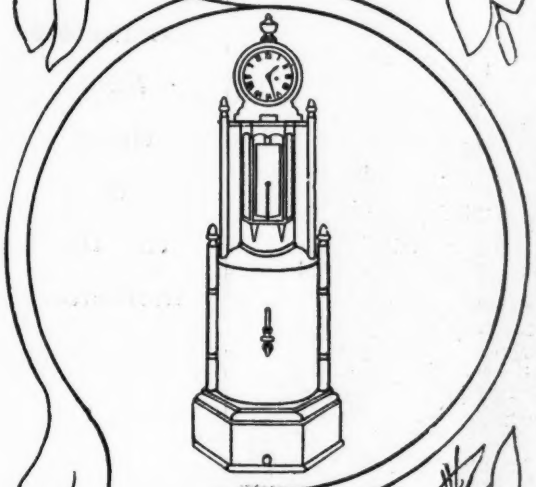

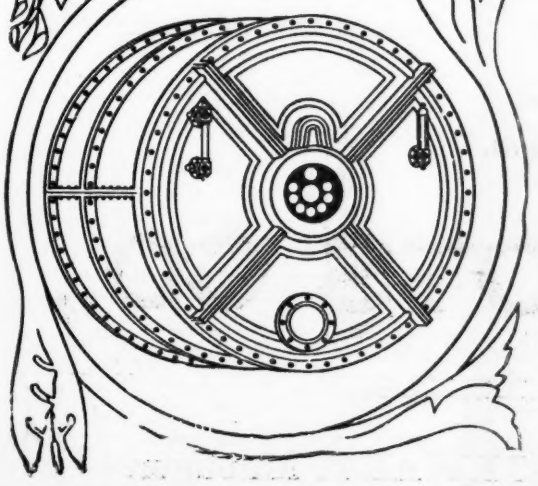

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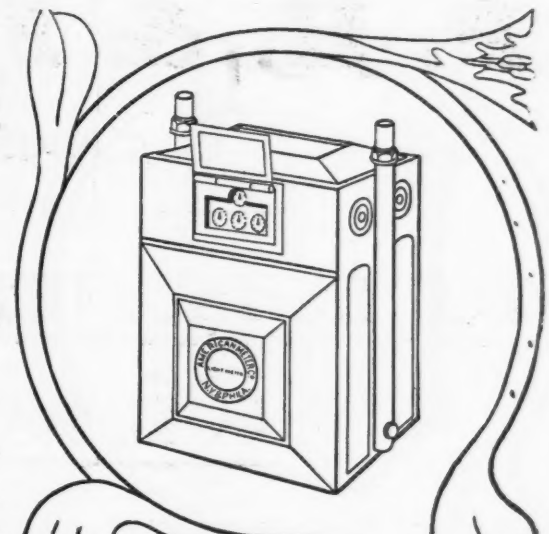
PUBLIC LIGHTING TABLE.

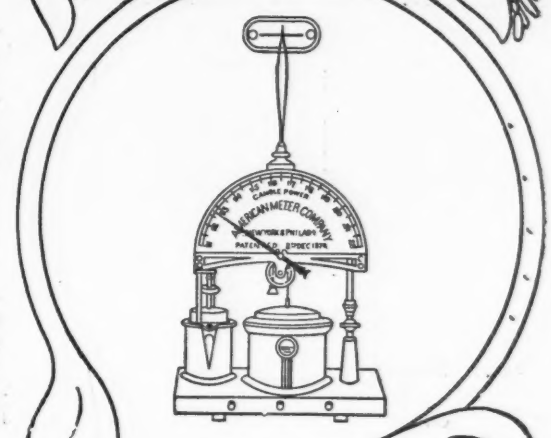
OCTOBER, 1896.

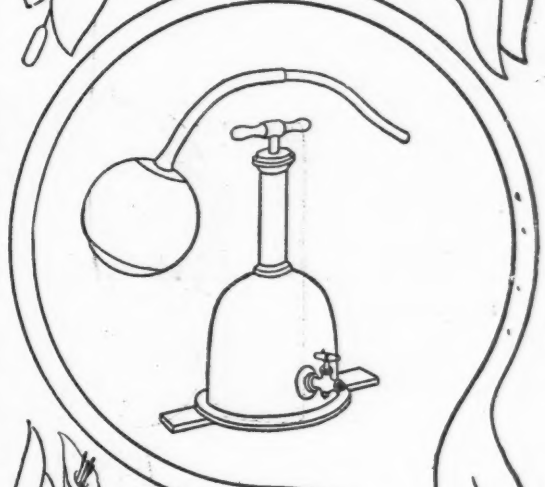
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Thu.	1	6.10 PM	1.30 AM	5.30	5.00
Fri.	2	6.10	2.50	5.30	5.00
Sat.	3	6 10	5.00	5.30	5.00
Sun.	4	6.00	5.00	5.30	5.00
Mon.	5	6.00	5.00	5.30	5.00
Tue.	6	6.00 NM	5.00	5.30	5.00
Wed.	7	6 00	5.00	5.30	5.00
Thu.	8	6.00	5.00	5.20	5.10
Fri	9	6.00	5.00	5.20	5.10
Sat.	10	6.00	5.00	5.20	5.10
Sun.	11	7.50	5.10	5.20	5.10
Mon.	12	9.00	5.10	5.20	5.10
Tue.	13	10.10 FQ	5.10	5.20	5.10
Wed.	14	11.10	5.10	5.20	5.10
Thu.	15	12.20 AM	5.10	5.10	5.20
Fri.	16	1.20	5.10	5.10	5.20
Sat.	17	2.20	5.10	5.10	5.20
Sun.	18	3.20	5.20	5.10	5.20
Mon.	19	4.20	5.20	5.10	5.20
Tue.	20	No L.	No L.	5.10	5.20
Wed.	21	No L. FM	No L.	5.10	5.20
Thu.	22	No L.	No L.	5.00	5.30
Fri	23	5.40 PM	6.50 PM	5.00	5.30
Sat.	24	5.40	7.30	5.00	5.30
Sun.	25	5.30	8.10	5.00	5.30
Mon.	26	5.30	9.10	5.00	5.30
Tue.	27	5.30	10.10	5.00	5.30
Wed.	28	5.30	11.20	5.00	5.30
Thu.	29	5.30 LQ	12.30 AM	4.45	5.35
Fri.	30	5.30	1.40	4.45	5.35
Sat.	31	5.30	2.50	4.45	5.35

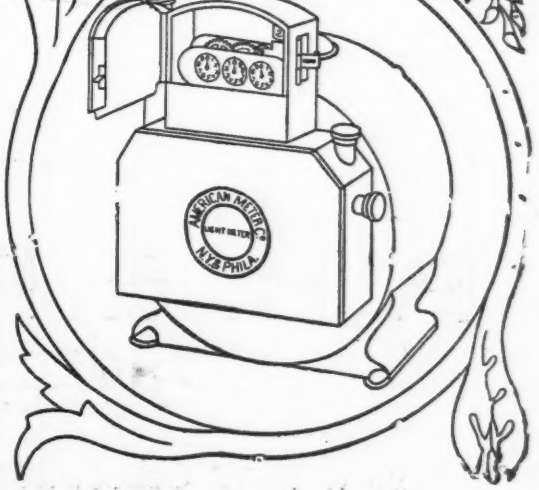
TOTAL HOURS LIGHTING DURING 1896.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	220.40	January	423.20
February	207.00	February	367 40
March	193.00	March	355.35
April	174.10	April	298.50
May	164.00	May	264.50
June	142.10	June	234.25
July	142 10	July	243.45
August	150.50	August	280.25
September	163.00	September	321.15
October	193.10	October	374.30
November	207.00	November	401.40
December	237.30	December	433.45
Total, yr.	2194.40	Total, yr.	4000.00









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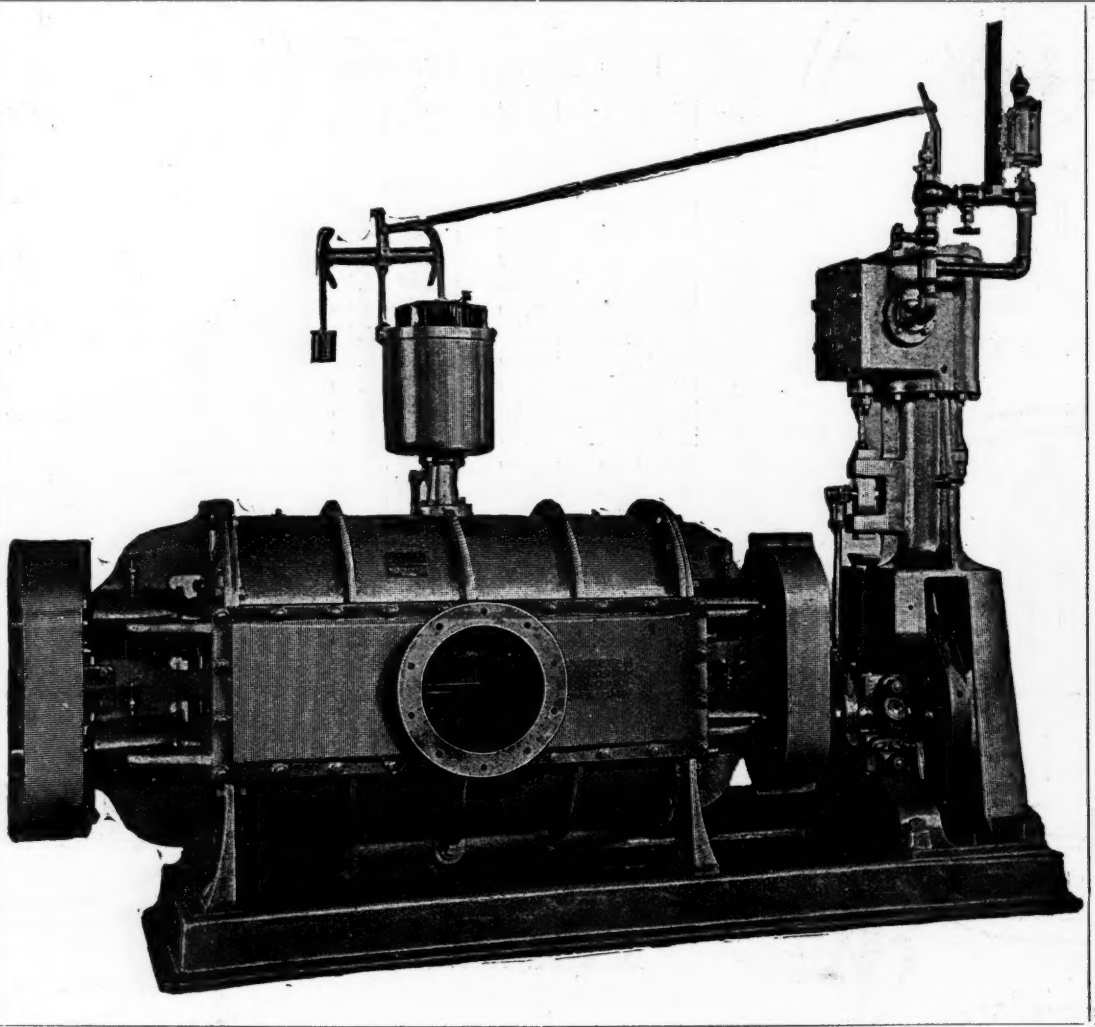

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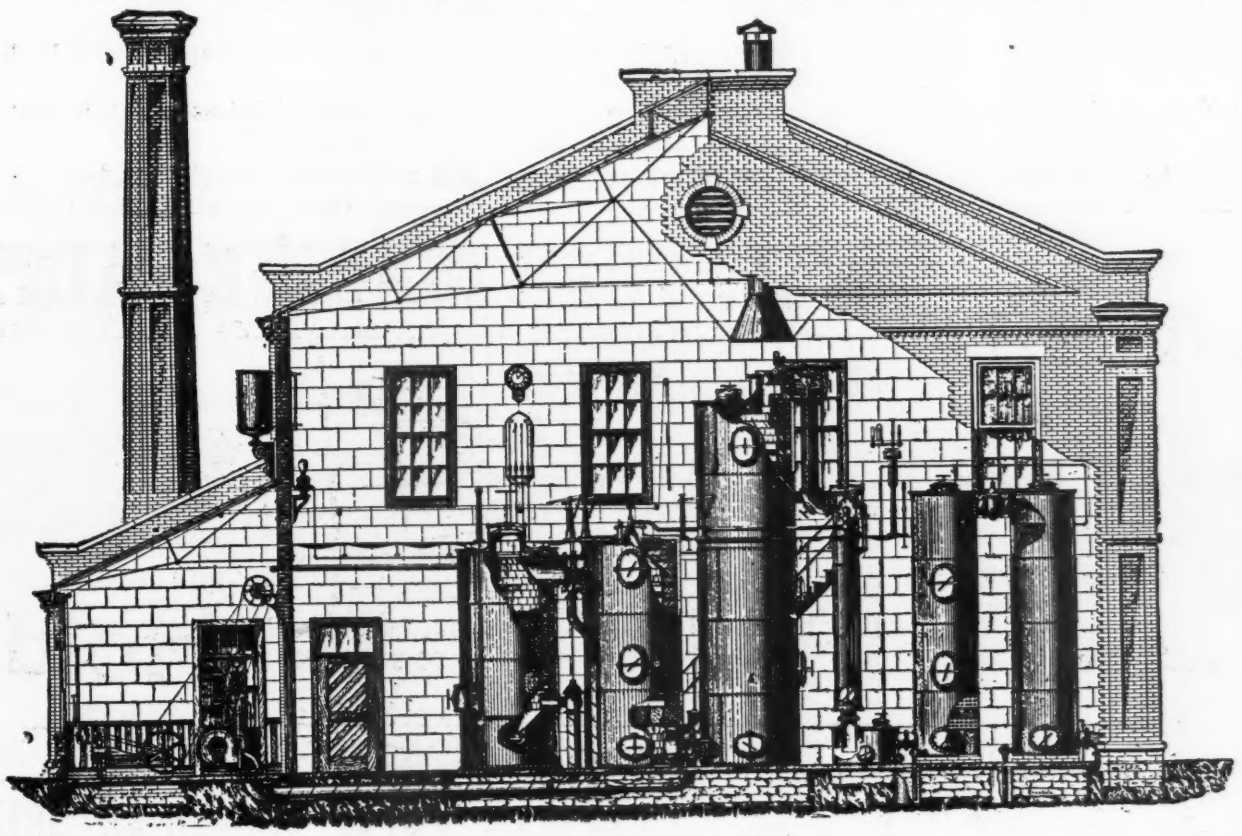

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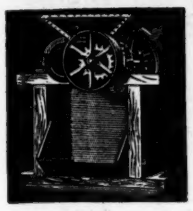

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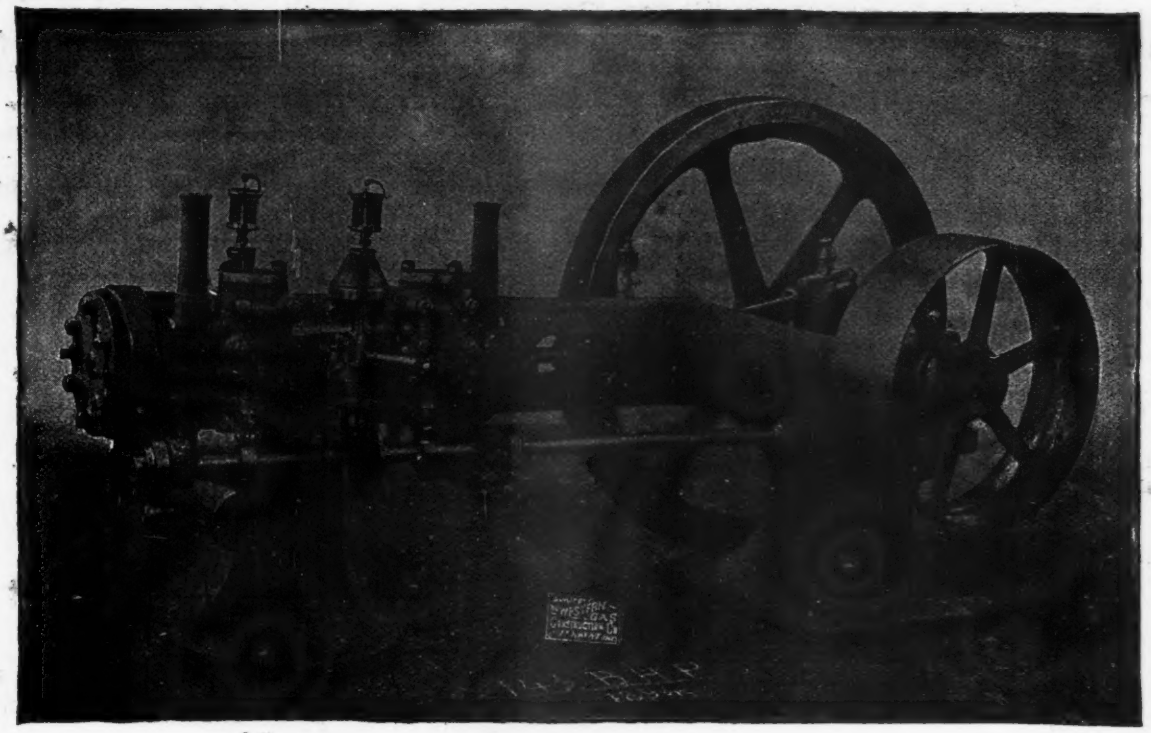

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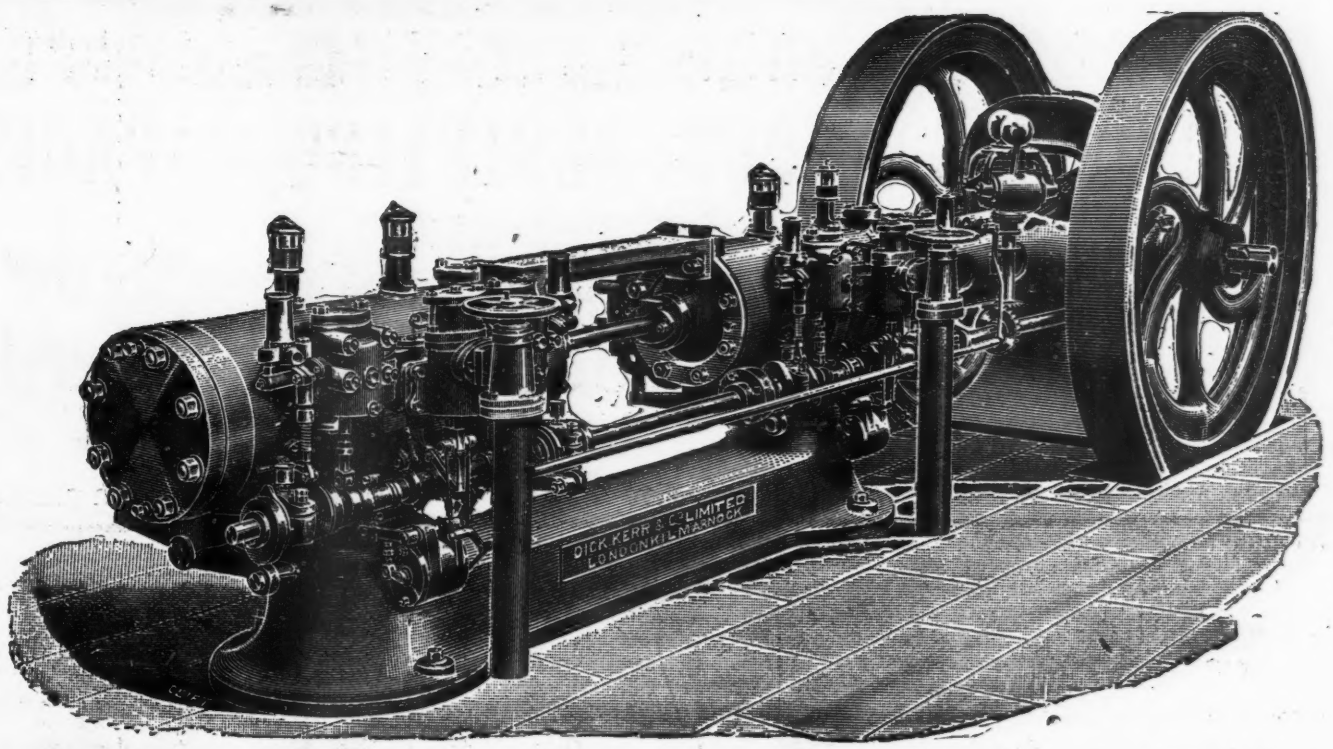

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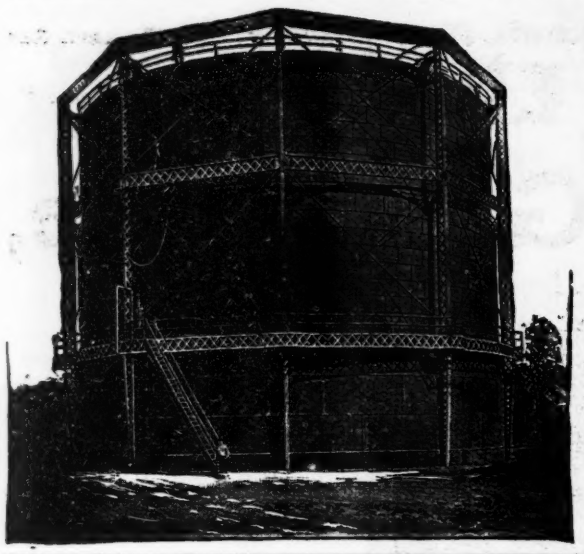

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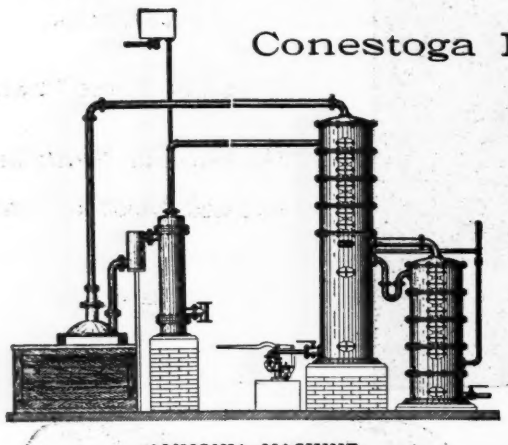

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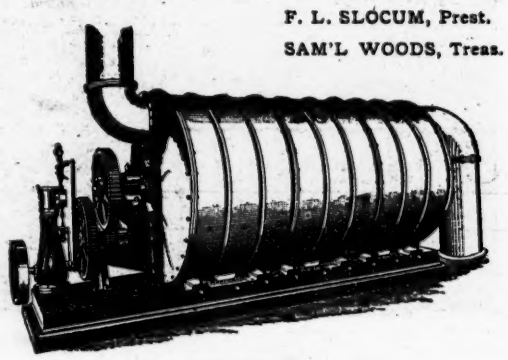

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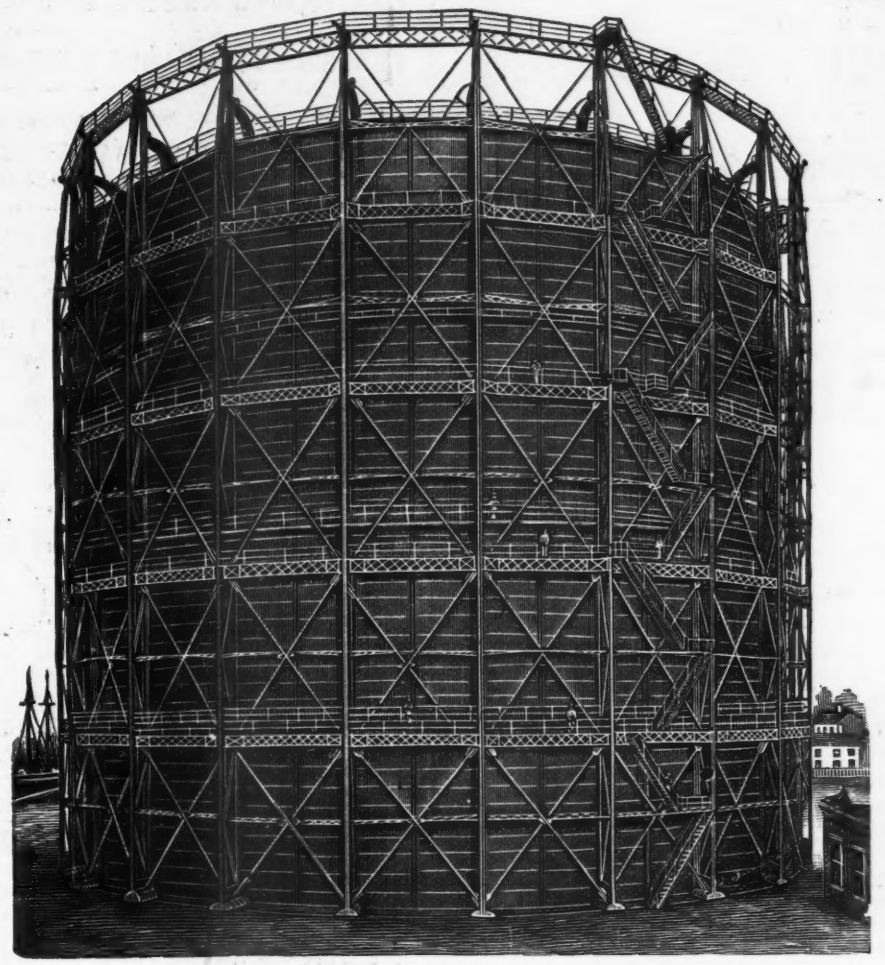

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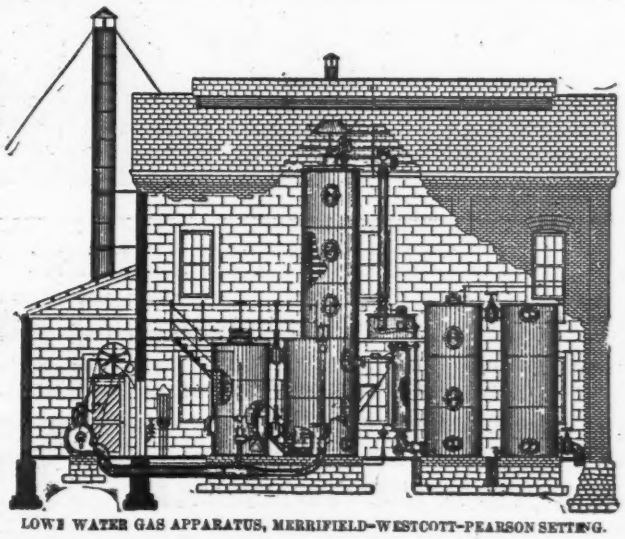

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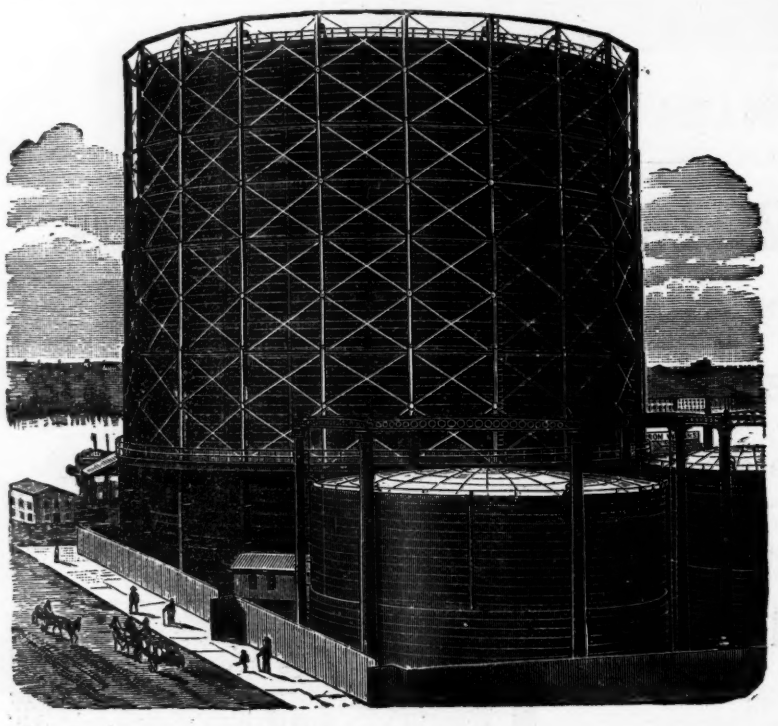

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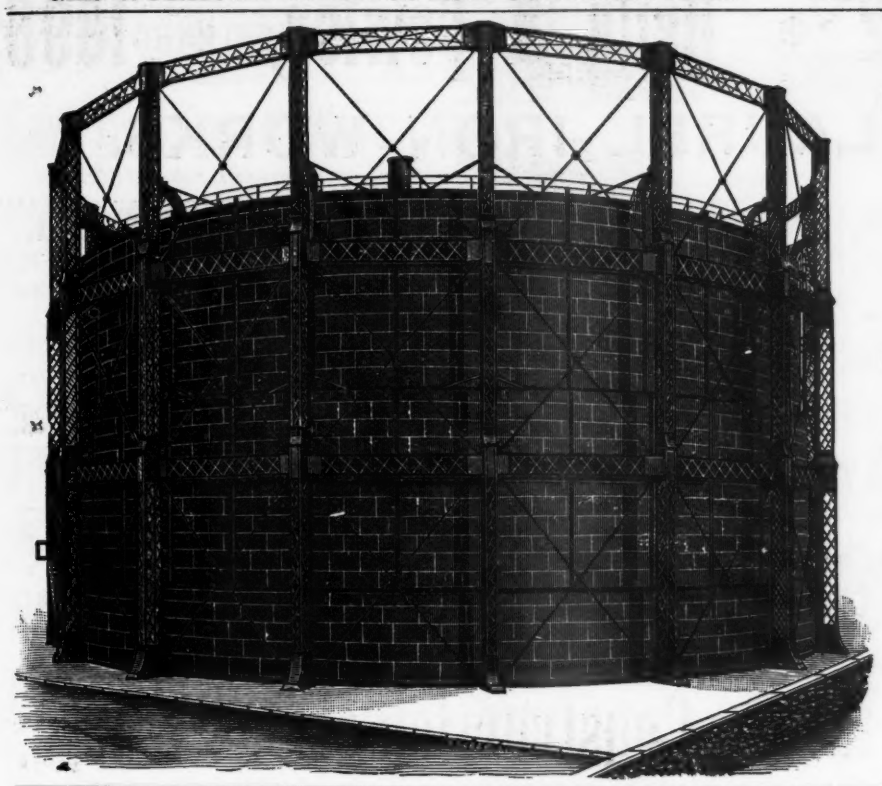

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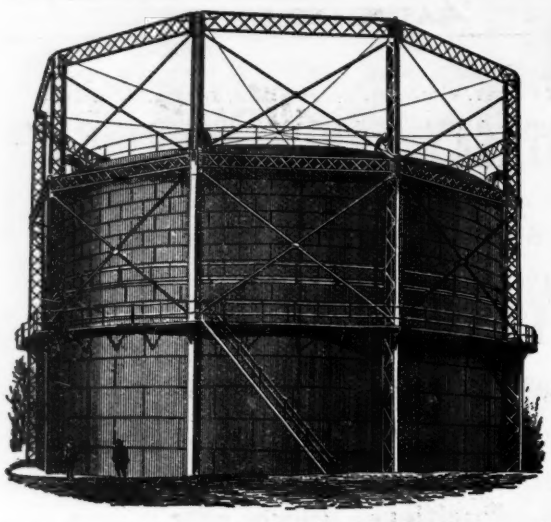

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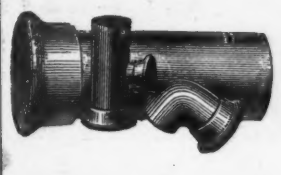

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WET AND DRY GAS METERS.
STATION METERS.
EXHAUSTER GOVERNORS.
DRY CENTER VALVES.
GOVERNORS FOR GAS WORKS.
PRESSURE REGISTERS.
PRESSURE & VACUUM REGISTERS.
PRESSURE & VACUUM GAUGES.
CRESSON GAS REGULATORS.
MARSLAND WATER METERS.
METER PROVERS.
PORTABLE TEST METERS.
EXPERIMENTAL METERS.
AMMONIA TEST METERS.
BAR & JET PHOTOMETERS.

Manufactories:
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GAS STOVES.
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SUGG'S ILLUMINATING POWER METER,
Wet Meters, with Lizar's "Invariable Measuring" Drum.

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Established 1848. 1339 to 1349 Cherry Street, Philadelphia, Pa.

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Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

METERS REPAIRED

PREPAYMENT GAS METERS.

Our Own Patents. Strong. Simple. PROMPT ATTENTION. CORRESPONDENCE SOLICITED.

D. McDONALD & CO.,

Established 1854.

511 West 21st Street, NEW YORK CITY.
51, 53 & 55 Lancaster St., ALBANY, N. Y.
34 & 36 W. Monroe St., CHICAGO, ILL.

MANUFACTURERS OF

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STATION METERS, EXPERIMENTAL METERS, METER PROVERS, PRESSURE & VACUUM REGISTERS & PRESSURE GAUGES.

Meters of all makers Thoroughly Repaired.

THEODORE D. BUHL, President. CHARLES H. JACOBS, Vice-Pres't and Managing Director.

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MANUFACTURERS OF GAS METERS.

METER REPAIRING A SPECIALTY.

Third, Fourth, Congress and Larned Streets, = Detroit, Mich.

We claim Superiority in Construction and unequaled facilities for making prompt deliveries to all parts of the country. *Mail and Telegraph Orders Solicited.*

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For smooth and quiet running.
For simplicity of construction and grace in design.
For general reliability.
For close regulation of power.

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The "OTTO"--The First.

The First to use the four-stroke cycle. **The First** to admit well measured and distinct charges of gas into an air space. **The First** in the adoption of poppet valves. **The First** to develop the tube igniter, with automatic or timed firing. **The First** to have a reliable electric and a practical magnectic igniter.

THE FIRST SMOOTH RUNNING & NOISELESS GAS ENGINE COMBINING EFFICIENCY & SIMPLICITY.

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With Patent Alloy Tube, good for one year.

With timing device for ignition, preventing starting backward; or with electric igniter.

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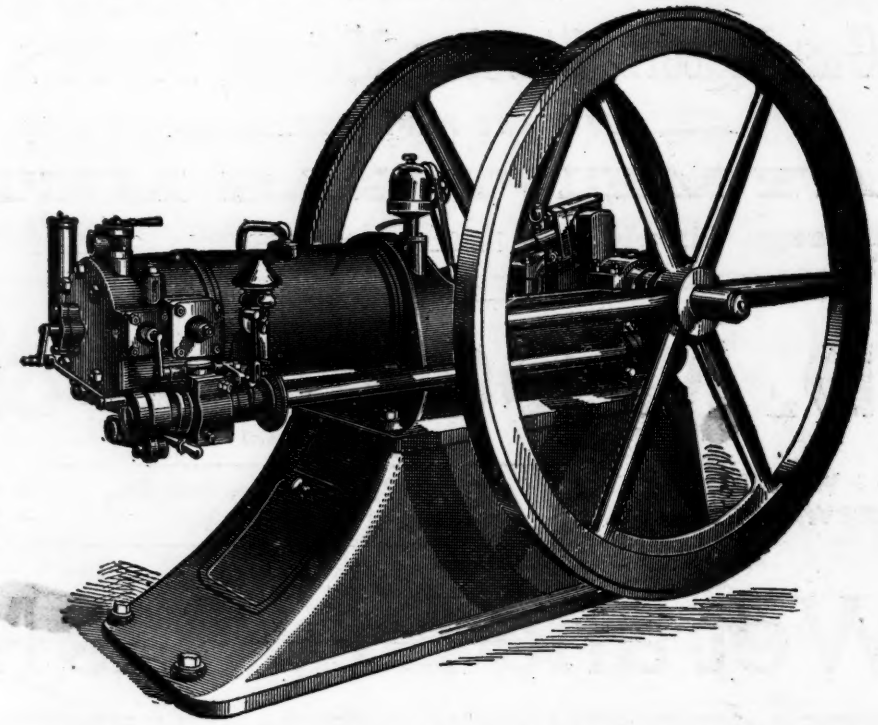

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For simplicity of construction and grace in design; for general reliability and ease of management; for quiet and smooth running qualities; for efficiency and low gas consumption; for regularity of speed and close regulation of power.

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